PROCEEDINGS

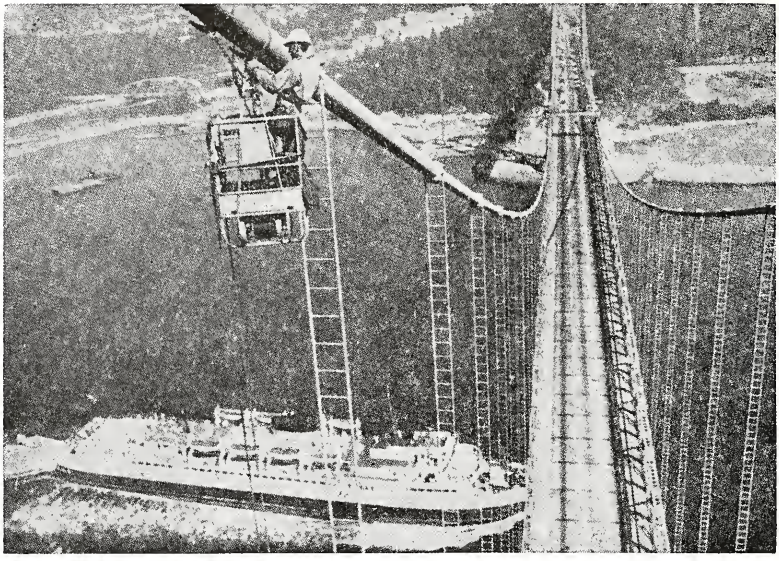
Seventy-Eighth Annual Convention

OF THE

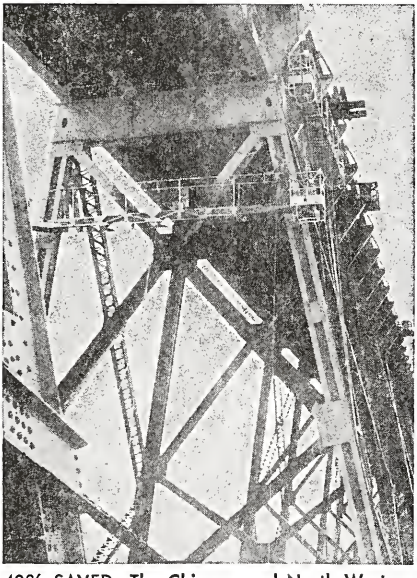
American Railway

Bridge & Building Association

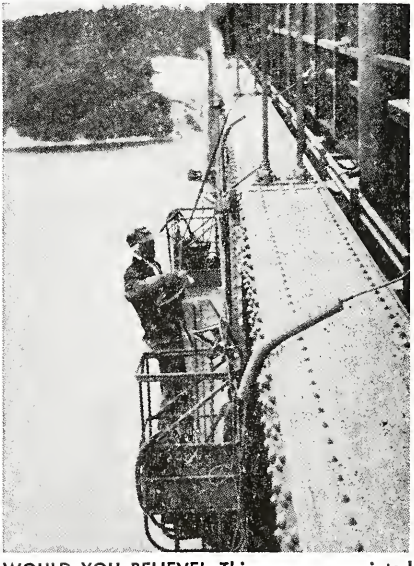
1973



RIDING HIGH—Painter operates his Spider horizontally and verticolly along cable of Lions Gate Bridge, Vancouver, B. C.



40% SAVED—The Chicago and North Western Railroad, through the use of modern material and equipment, reduced their bridge painting costs by 40%.



WOULD YOU BELIEVE! This one man painted more area than five men working from a multi-deck scaffold on the opposite side of the bridge.

(Photos illustrative only. Products must be used in conformity with safe practices and applicable codes and regulations.)

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Proceedings of the

Seventy-Eighth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 17-19, 1973

Published by the Association
18154 Harwood Ave., Homewood, Ill. 60430
R. E. Dove, Editor

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PROCEEDINGS

78th Annual Convention

September 17-19, 1973

Conrad Hilton Hotel, Chicago

The 78th Annual Convention of the American Railway Bridge & Building Association was held September 17-19, 1973 at the Conrad Hilton Hotel, Chicago. For the 28th consecutive year, it was held concurrently with the Annual Meeting of the Roadmasters' & Maintenance of Way Association.

As has been the custom, the mornings of the first two days of the meeting were joint sessions with the Roadmasters' and the afternoons of these two days and the morning of the third day were held as separate sessions.

Total registration for the joint convention was 750, which was an increase over the preceding year. Both yearly conventions were non-exhibit years.

The joint session on Monday was the opening session and, in addition to an invocation by Dr. Kenneth Hildebrand, pastor of the Central Church, Chicago, greetings from D. V. Sartore, president, AREA, and L. A. Grego, president, Railway Engineering-Suppliers Association, and remarks by J. R. Rushmer, first vice president, REMSA, the program included the keynote address by Alan Boyd, president, Illinois Central Gulf Railroad Company, Chicago on "Light At the End of the Tunnel," and addresses on "The High Speed Ground Test Center—Update September 1973," by Ross T. Gill, staff engineer, DOT High Speed Ground Test Center, and on "Prevention Is the Key," by R. D. Shaver, superintendent of safety-system, Atchison, Topeka & Santa Fe, Chicago.

At the joint morning session on Tuesday, addresses were delivered on "Money Makes the Mare Go," by R. C. Grayson, president, St. Louis-San Francisco; on "At Derailments—Don't Become A Problem or A Corpse," by E. R. Schlaf, superintendent fire prevention, Illinois Central Gulf, Chicago; and "Opportunity Unlimited—The Decade Ahead," by Carl S. Winters.

Separate Sessions

The separate B&B sessions were presided over by N. D. Bryant, president and assistant bridge engineer-construction and maintenance, Frisco, Springfield, Mo. The session on Monday afternoon included an address and report on the state of the Association by President Bryant; recognition of past presidents; a committee report on Water and Air Pollution As Applicable to B&B Work; an address on "Reconstruction of Penn Central's Shocks Mill Bridge Across the Susquehanna Following Damage by Agness Floods," by W. J. Sponseller, assistant chief engineer-construction, Penn Central; and an address on "Advanced Techniques of Underwater Inspection and Photography," by Robert J. Whitman, president, Entcor, Inc.

The Tuesday afternoon B&B session included a discussion on the "Problems and Procedure When Installing One-Spot Car-Repair Facilities," by O. C. Denz, supervisor building maintenance, Milwaukee Road, Chicago; a presentation of a report on "Uses of Plastic Pipe," by Ray Durazo, executive

manager, Plastic Pipe Institute; an address on "Special Design for Protective Cell and Floating in Vertical Lift Span and Towers, Southern Pacific's Atchafalaya River Bridge," by F. T. Alley, engineer bridges, Southern Pacific, Houston, Tex.; an address on "Techniques for Use with Power Staging," by Edward L. Ens, branch manager, Spider Staging Sales Co.; and an address on "Grouting Timber Piles on the Frisco," by Lawrence D. Green, associate structural engineer, Frisco, Springfield, Mo.

The last separate session, held on Wednesday morning, included two committee reports, the business session and the election and installation of officers.

Election of officers

The officers and directors elected and installed by the Association for the 1973-1974 period are:

President: E. E. Runde, manager construction, Illinois Central Gulf, Chicago.

First Vice President: J. J. Ridgeway, director engineering service, Bessemer & Lake Erie, Greenville, Pa.

Second Vice President: J. R. Williams, engineer bridges, Rock Island, Chicago.

Third Vice President: W. H. Rankin, senior structural engineer, Frisco, Springfield, Mo.

Treasurer: W. H. Huffman, assistant vice president-engineering, North Western, Chicago.

Secretary: Mrs. Ann Wilson, 18154 Harwood Ave., Homewood, Ill.

Directors: W. E. Brakensiek, bridge engineer, Missouri Pacific,, St. Louis, Mo.; O. C. Denz, supervisor building maintenance, Milwaukee Road, Chicago; and R. C. McMaster, engineer facilities and structures, Bessemer & Lake Erie, Greenville, Pa.

Introduction of Alan S. Boyd

President Peak: Gentlemen, it gives me great personal pleasure, and, Mr. Boyd, it gives me particular personal pleasure to introduce our next speaker to you, although I think perhaps he needs no introduction to many of us.

He was born in Jacksonville, Florida, and after serving in the Air Force during World War II, he earned a law degree from the University of Virginia in 1948.

He saw Korean war duty as a U. S. Air Force Major.

In 1954 he was named to a committee for aviation development in Florida, from whence he progressed to membership and later chairmanship of the Florida Railroad and Public Utilities Commission.

From there he was appointed to the Civil Aeronautics Board in 1959 and named chairman in 1961.

When the new Department of Transportation was organized in 1966 his rich and ecumenical experience in the transportation field made him a natural to be the first Secretary of Transportation.

In 1969 the Illinois Central was fortunate to obtain his services as President.

Gentlemen, I give you Alan Boyd, President and Chief Executive Officer, Illinois Central Gulf Railroad. (Applause)

Light At the End of the Tunnel

By Alan Boyd

President, Illinois Central Gulf, Chicago

Thank you, Roland. Good morning, folks.

I want to apologize for my split-second timing. Normally, I would have gotten here a little earlier but this morning we have been working on our 1974 budget and I was trying to explain to some rather unhappy people why it was we had to provide more money for maintenance of way and less for them. So I hope you will see me as a friend—even if a late one.

Roland said there really wasn't any need for me to come at all if that's what I was doing.

I'm delighted to be meeting with you this morning and I am particularly pleased to have been invited for your opening day program.

Your deliberations these next three days are vital to the future of our industry.

Because of the widespread dollar shortage in our industry, practically all of us have had to cut back in one way or another. Such cutbacks have affected attendance at meetings of this type. To paraphrase the question used to question travel during World War II, rail managements are asking, "Is this meeting necessary?" My personal reaction, considering the importance of the work performed by the members of your two organizations, is "Yes, indeed."

Traditionally, on the Illinois Central Gulf, we have given full support to our men when, through ability, energy and enthusiasm, they rise to the leadership of railroad associations. We are gratified that an ICG man leads the Roadmasters. We believe that Roland Peak not only will return from this meeting a better engineering officer, but also as a better leader. He will speak from greater assurance and with broader knowledge in the years ahead because of his experience as president of the Roadmasters' Association.

Certainly this is true of Allen Sams, who served as president of AREA the term before last. We confidently expect it will be true of Erwin Runde as an officer of the B&B Association. In the nature of things, responsibility makes big people bigger.

I approach you this morning with no question in my mind as to what you want to hear about. Each railroad has its own particular set of problems. But I have no doubt that all of you want to hear everything you can about the future of track maintenance.

I can almost tell you what is running through your minds: There's no lack of business, you're saying, but we can hardly keep our railroad together. We're not making any progress toward correcting the deferred programs of lean years. We need everything. What will happen if a recession hits? How are we going to get ready for the big increases in tonnage that will come with a growing population?

Yes, there are worrisome questions. I hear them at staff meetings, as do most railroad presidents. I promise I'll try to not use any glib generalizations in answering such questions. In schools of management they tell you to define the problem before attempting any answers. The questions are hard. Answers are not easy.

What are the problems?

Just what is the situation in the field of track—and bridge—maintenance?

For better perspective, let's go back in time. The railroads did a magnificent job during World War II. They came out of that conflict like a fighter after a hard fight, battered and bruised.

In the following decade, the railroads spent heavily to restore the physical plant. But before railroads could fully catch up, they began to feel the pressure of intensifed competition by air, highway and waterway. The rail share of the market began to slide, slowly at first, then at a more alarming rate.

During the sixties, the railroads responded to the competitive challenge. They adopted modern marketing ideas. They sought to give the shipper service he wanted. Instead of saying as in the past, "Here's what we have to offer," progressive roads began to ask, "What do you need in the way of schedules, equipment, rates, new techniques?"

And the shippers told us. We want modern freight cars that help us cut our loading and unloading costs. We want less damage. We want reliable schedules. Shippers wanted a lot. Railroads tried to answer those wants.

The result? The railroads, working closely with the rail supply industry, developed an entire new generation of freight cars.

But then, as now, there was only so much money to use for the property. The rate of return on railroads has been low for a long time. Money for fixed plant purposes has not been available for years. As a result, something had to give at budget time. You men know what had to give. In the first half of the sixties, maintenance suffered on many roads. All the while, heavier cars, longer trains, and more powerful engines, hammered the right-of-way. By the end of the sixties, derailments and schedule disruptions increased steadily.

FRA Track Standards in effect

Perhaps in response, the Federal Railroad Safety Act came into being in October, 1970. A year later initial rules and regulations, orders and standards went into effect. They covered track inspection, drainage, vegetation, and rail defects. As you all know, rules on crossties and track geometry go into effect in October.

When the Department of Transportation was created, as first secretary, one of my concerns was the decline in railroad safety. The sixties were bad for train accidents. By the end of the sixties, defective track accounted for more than 30 per cent of all accidents.

That is why, when I spoke at the annual AREA luncheon here in Chicago a year ago last spring, I expressed my conviction that a system of track standards codified by government was needed. I recognized then, as I do now, that the adverse earnings ratio of our industry has been a powerful temptation to cut corners on maintenance of the fixed plant. I said that with good government standards, track engineers on our railroads at budget time would have support for their requests in the form of measurable needs.

We have come a long way since October last year. From what I have heard, good relationships have developed between railroad engineering officers and FRA regional engineers and track inspectors. Railroaders approached the standards with some trepidation. They viewed certain standards as impractical, as not consistent with either actual operating needs or our financial ability. But their fears have not come to pass. Instead, FRA men, by and large, have been concerned with creating practical and realizable goals.

Now, I would be a wide-eyed innocent if I believed there are no remaining problems. The new demands of the track safety code are going to give us fits. Still, I can't help but feel that in establishing a minimum standard of track safety we are laying the groundwork for a more successful railroad industry. What has taken place in hundreds of meetings between company and FRA representatives all over the United States has been a shaping and reshaping of the language and the sense of the standards. Certainly we could not have continued the way we were going. We are now changing direction.

We in management are greatly in

debt to the engineering representatives who participated in those meetings. With patience and skill, FRA staff members made adjustments where standards were excessive, to not burden railroads with costs that do not improve safety. It is estimated that those adjustment meetings, if I can call them that, saved the industry perhaps as much as $600 million in one-time costs.

No doubt the present standards still require adjustment. Here and there, they are more restrictive than necessary. Allen Sams at a recent staff meeting, for example, pointed out that in his opinion standards for super elevating tracks on curves are not well drawn. The industry practice of incorporating up to three inches of unbalance to reduce wear on the inside rail has proved through long experience to be entirely safe. I feel confident such technical differences will be resolved in time.

Allen, may I say, reminds me of Cato, a senator of ancient Rome. It is recorded that during the wars between Rome and its great enemy, Carthage, whenever Cato arose on the floor of the Senate, no matter what the subject was being discussed he opened his remarks with the words, "Carthage must be destroyed." Whenever Allen speaks at staff meetings, he says, "We need more ties, more rail, more ballast."

Yes, Allen, we in railroad executive managements hear you loud and clear. We too are concerned with our need to upgrade our track in compliance with the standards. In recent years, with considerable difficulty, many roads have used cycle maintenance for track. It has proved effective in giving us fuller use of shrinking track crews. If standards for higher speed tracks force us to spot replacement of ties, it will be at the cost of system efficiency.

Nonetheless, I stand by my conviction. Well-defined track standards, on balance, will help the rail industry, not hurt it.

I can almost hear some of you saying, "That sounds good. But can we meet government standards with limited budgets, limited supplies and limited manpower?"

Let me try to answer that question with a story.

A wealthy man with an interest in exotic birds had a call from a dealer. "Come right over. I have a bird that speaks five languages."

The man did. Sure enough, the bird spoke five languages, clearly and distinctly. The wealthy man paid a thousand dollars for the bird and took it home. He went to the office next day without telling his wife about his wonderful purchase. That evening he hurried home and said to her:

"Have you seen my new bird?"

"Yes," she said, "it's in the oven."

"In the oven," he shouted. "Don't you realize that bird speaks five languages?"

"Maybe so," she answered, "but it didn't say anything to me."

Like the bird that spoke five languages, we have not spoken up when it was important to do so.

Any why is it important? Because we have gone about as far as we can in helping ourselves. It has been a miracle of financial management that more roads have not gone into bankruptcy. As an industry we have learned how to do without, how to get by with minimum expenditures. We should invest $3-4 billion a year in capital improvements. But we scraped by with less than half that amount. We can't go on forever that way.

In recent years, on our road, we have proudly recounted how many ties we have put down. For four years we have installed a million or more new ties. Impressive though that may be, it does not mean we are catching up. We need more—as do practically all railroads.

Railroads must earn more

Obviously, we need to spend more

on the physical plant. But we haven't had the money in recent years, or can get it only at high rates. That leaves us only one alternative—we simply have to earn more.

That's my answer to the question of how we can meet the standards. We have to earn more. But we can only do that my changing the rules under which railroads compete for business.

Since World War II, government promoted other forms of transportation. That sponsorship brought immense new highway, airport and waterway capacity. It made possible a huge new private carriage industry. All too often, it left railroads with traffic no one else wanted to handle.

Does that mean railroads are through? Not a bit. Nothing in sight can replace the railroads.

Indeed, railroads at this rather sad time in their history, are likely entering a new Golden Age. Railroads have great advantages in the efficiency with which they use fuel to create transportation—four to five times as much tonnage as trucks with equal use of fuel. Railroads conserve space as compared to highways or airports. Space is becoming much more precious. Railroads disturb the air, earth or the water less than other forms of transportation in creating equivalent transport. Railroads, in my view, are pre-eminently a transportation mode for the future. Responsible people in industry, academe and government are starting to turn to railroads for answers to future problems.

One of our good rail supply companies, Stanray, in an advertising poster has put it very well: "Railroads are for the birds—*and* for trees . . . air . . . people." A publication I read, the Economist, a few months ago ran an advertisement for British Railways with a pointed headline: "British Rail's Gift to the Country May be the Country."

A moment ago I said the rules of the game must be changed. *We* can't change them. Our political leaders must want to change them. Only the public can make them want to do that.

Need favorable legislation

Well, as all of you know, we made a valiant effort to reach the public with our story. We knew we had to convince the public of the merits of our case before we could hope to reach their representatives in government. In 1971 and in 1972 a transportation bill was introduced that would have been a start toward putting railroads on the road to equality with their competitors and, as I said, toward a new Golden Age. But Congress, harassed by the pressing problems of the war, civil unrest, inflation, and other pressing matters of the moment, simply did not find time to fully consider that bill.

This year, transportation leaders are determined that some resolution of the rail industry's problems be enacted. So far, Congress and the nation have been hypnotized by Watergate. Watergate, for all its unpleasantness, is serving a useful purpose. We are being reminded of what we in these United States believe about the need for separation and integrity of the executive, legislative and judiciary branches of our government—and also some fundamentals like decency, truthfulness, fairness, faithfulness and loyalty. This clearing-of-the air cannot help but favorably affect Congressional handling of rail reform.

Two main railroad needs are before Congress. One is to enable Penn-Central and other bankrupt eastern railroads to continue to operate while their tangled financial problems are resolved. It is an understatement to describe their problems as complicated.

The other main railroad need is passage of one or more bills to help the railroads get low interest loans for equipment and track work, fair taxation, help for grade crossing separation and protection, and greater freedom to adjust rates.

This is the year of the railroads. We know it can happen.

Last month, for the first time, a bill opened up the highway trust fund. Until now, that multi-billion dollar fund has been used only for highways.

The $200 million earmarked for the mass transit is only one percent of the $20 billion authorized but it represents an important victory for the public's need of more than just highways.

Letters are helpful

For the past two years, thousands of railroaders, members of their families, plus friends in the rail supply industry and the general public, called upon Congress to write new transportation laws. Was all that work wasted? I think not. In those two years we helped open the eyes of Congress to what was happening in transportation. Now we have a chance, and a good chance, to get action.

We must have still more of your help in getting the attention of your Congressmen. A letter from you is significant to the men who represent you in Congress. Letters from members of your family and friends will further encourage him to look hard at the railroad picture. Letters from employees in your departments, and from all the people you deal with, will further impress him with a sense of urgency.

I am asking all the employees of the ICG once again to raise their voices and give Congress a view of their thinking. I have asked the thousands of our retirees to write. They are responding. There is nothing phony about this. It is part of the American system of representational government. We must not be like the bird that went into the oven without saying anything.

No one else will do this job for us. You and I, and the half million people of the railroad indusry and whatever allies we can gather are going to have to carry it through. I particularly look to you, because you, better than most, know how terribly important it is that we find the means to build better railroads.

Our nation is expanding and growing. It must have better railroads. And even before that, we need the kind of railroads that can carry today's traffic safely and well.

As I said, the only effective way is to get the rules of the game changed. I have no qualms about our ability to compete, and to compete hard, once we are put on an equal basis.

The title of my remarks this morning is "Light at the End of the Tunnel." Not a very original way of saying it, perhaps, but I think it is an accurate way to describe where we are. We *are* in a tunnel. We *have* been for too long. But I honestly believe we can see light. We can reach the end of that tunnel and burst out into the sunlight. With your help, we can.

President Peak: Thank you, Mr. Boyd. I'm sure we appreciate those words of encouragement. Some of us have in past years felt sort of like the fellow who went to a pep meeting at his company's headquarters and when he got back, they asked him what they said, and he said, "They said 'cheer up things could be worse.'" And he said, "They were right because when I cheered up things got worse." We hope they are going to get better. We know you are busy. We value your presence but you have demands on your time, like getting more money for maintenance of way, but we will be delighted to have you stay for as much of our program as you can, but when you feel it necessary to leave, feel free to do so.

Darrell, I'll turn the podium over to you.

Introduction of Ross T. Gill

President Bryant: I previously mentioned that in the past three years we have had three gentlemen who gave us an insight into what was taking place or going to take place in Pueblo, Colorado, at the High Speed Ground Test Center. Today we are privileged to have with us a man who is eminently qualified to bring us up to date on the high speed ground test center.

He has been with the Federal Railroad Administration since 1970, having been associated with the Kansas Test Track on the Santa Fe at Wichita,

Kansas, and the High Speed Ground Test Center, both in Washington, D. C., and at Pueblo, Colorado.

He holds a B. S. degree in mechanical engineering from New Mexico State University. Prior to joining the FRA he was asociated with the Southern Pacific for nine years, having been involved in the Colton Cutoff and also in design, development and testing of the Vertipac rail car.

It is my privilege to present to you Mr. Ross T. Gill, staff engineer, DOT High Speed Ground Test Center, Pueblo, Colorado. Mr. Gill. (Applause).

High Speed Ground Test Center Update September 1973

By Ross T. Gill

Staff Engineer, DOT High Speed Ground Test Center, Pueblo, Colorado

I wish to thank all of you for allowing me your time to present an update on the High Speed Ground Test Center at Pueblo, Colorado. Also, I want to express a special thanks to Mr. Bill Autrey for inviting me here today.

I know that some of you have had the opportunity on various occasions to visit the Test Center in the past, and I hope you all will have the opportunity in the future. The most important aspect toward the future of this test facility is the knowledge that you as potential users have of this facility's capability and benefits that can be derived.

Slide #1) First off, I'd like to give you a basic overview of the High Speed Ground Test Center. We are located near Pueblo, Colorado, some 20 miles northeast of the actual community. We are served by rail through the Pueblo Army Depot to the south from North Avondale, over the ATSF and MoPac Lines. This center is managed by the FRA with operations and maintenance support contracted to Kentron-Hawaii Ltd. The 30,000 acres of real estate on the Test Center is leased from the State of Colorado. This land was previously used for cattle grazing by various cattle companies in the area. The area is semi-arid with temperatures dropping to $-30°F$ in winter and $107°F$ in the summer. Spring brings an abundance of sand and tumbleweed to toughen our test environment.

(Slide #2) The majority of our test tracks and guideways presently exist in the southerly half of this site as seen here. To the right in the middle on the eastern boundary lie the majority of our test support facilities.

Briefly, the large major outer loop

represents the Tracked Air Cushion Research Vehicle 22-mile proposed guideway. To the east and paralleling south along the guideway is our Linear Induction Motor Research Vehicle (LIMRV) 6-2-mile test track. At the upper right and inside the major TACRV oval is the light-bulb shaped alignment for the Urban Tracked Air Cushion Vehicle. Getting back to the real world we know so well is the Transit Track Oval and the Federal Railroad Administration's Conventional Rail trackages encompassing the Transit Oval in the south central portion of the site.

On the right hand portion of the screen is a detailed plan of the support facilities including the Wheel/Rail Dynamics Laboratory now under construction.

At this time, I'd like to take each track and guideway to explain in more detail just what's going on. I'll discuss the Wheel/Rail Laboratory facilities later on.

(Slide #3) The first track to appear at the Test Center was the Linear Induction Motor Research Vehicle track in 1971 for testing of #1, the performance of the double-sided linear motor as a means of propulsion in future vehicles, and #2, to study the behavior of the steel wheel on steel rail system using the Budd Pioneer III truck as suspension for this 50,000-lb., high-speed vehicle. To date, we have operated this vehicle unmanned via telemetry to 191 MPH. The existing 6-2-mile length of track allowed us no more, so we elected to modify the LIMRV and add two jet engine boosters to speed our acceleration to 240 MPH, thus eliminating the need for more track.

The track itself is somewhat common in design with the exception of a 22-in. high aluminum-extruded reaction rail in the center that acts somewhat analogous to a stator for the 2500-HP linear motor. However, our track maintenance techniques no doubt would appear quite rigorous to those currently used in the industry today. Since we cannot maintain geometry with off-the-shelf equipment, we rely on a Track Survey Device which uses a laser reference to gather our geometry data, consequently a shim plan for the 119-lb. running rails as well as the aluminum reaction rail is used. The shim plan information tells the trackman to move the rails base vertically or laterally to the nearest 1/32 of an inch. (This is our present practical level in the field; however, the Track Survey Device Accuracy is indeed higher.) A shim nest is provided for in the fastener to accommodate these adjustments. To date, we have had little occasion to exceed the limits of the shim nests configuration.

(Slide #4) Adjacent to the LIMRV test track, we have a three mile concrete guideway for operating the 300-mph Tracked Air Cushion Research Vehicle. This guideway has a concrete reinforced 10-in. deep bottom slab with prestressed 25-ft. long side panels for guidance. We will have approximately 3½ miles of this guideway complete by November of this year.

(Slide #5) Who says it never snows in Pueblo, Colorado. Believe me that's not White Sands, New Mexico. To date, we have operated this vehicle successfully at 68 mph and intend to approach its maximum speed of 300 mph very carefully. Of course, additional guideway will be required.

(Slide #6) Here's the only proof I have that it does run. I hope this slide will suffice. It is planned to install later a linear motor in this vehicle. Power for the LIM will be provided through third rail pick-up attached to the guideway's side panel wall. The present configuration of the TACRV will propel the vehicle to 25 mph using the hot gases of the three fan jet engines for propulsion and the cold gases for levitation.

(Slide #7) Similar in principle to the TACRV is the Urban Tracked Air Cushion Vehicle capable of 150-mph operation and 60-passenger capacity. Keep in mind that this is not a research vehicle but a demo. This vehicle will be operating at the Test Center next

spring on completion of the first phase of its 3.3-mile guideway. This vehicle will be powered entirely through commercial third rail power for the linear motor propulsion system as well as the electric fans for levitation. The purpose in such a vehicle at the Test Center will be to provide information on initial costs, ride quality, cost/benefits, and maintenance data to urban areas where discussions of an intercity or short intracity system are pending. This vehicle may appear as a competitor with rail systems in the future when new routes and systems are being considered.

(Slide #8) The guideway is of a simple design being nothing more than a concrete slab which will have an aluminum reaction rail attached in the center for propulsion as well as guidance. Concrete construction techniques follow that used in typical highway and runway projects.

(Slide #9) Moving away from the advanced systems, we presently have a 9.2 mile Urban Mass Transit Test Track as I mentioned earlier. This slide indicates also the future proposed trackage crossing the interior of the loop. The present trackage contains several design configurations based on common standards used by various transit properties having third-rail wayside power pick up. Concrete ties with spacing from 24-in. to 30-in. centers, wood ties on 100-lb. welded and jointed rail sections, and welded 119-lb. rail on wood and concrete tie sections. Instrumentation is installed in the embankment at six major sections and designed to measure subgrade accelerations, displacements, moisture and densities related to track structure behavior and performance under traffic. Future plans for expanding this facility will include a perturbed track section, concrete slab tunnels and bridges, and tight turn loops for wheel-screech noise studies. All trackage and programs on this particular facility are sponsored and funded in whole or in part by the Urban Mass Transportation Administration of the U. S. Department of Transportation.

(Slide #10) Current programs have included studies with the NYCTA R-42 cars gathering baseline data on track geometry systems for possible use by the transit industry. Keep in mind that the goal on geometry systems here is directed toward quick and easy hang-on equipment compatible with the several varieties of transit cars. This system would not necessarily require committing a special car specifically designed and dedicated to track geometry services.

(Slide #11) In addition to the R-42 cars, the State-of-the-Art Cars have been operating since October 1972 at the High Speed Ground Test Center.

These cars went through a rigorous program of acceptance and engineering tests. Mechanical as well as electrical difficulties expanded the original program which proved very beneficial when considering that prior to the existence of the HSGTC, the cars would likely have had their problems in the midst of an operating revenue transit line and therefore would have required a longer extended period in which to debug all systems.

As many of you know, these cars unfortunately were involved in a serious accident in August at the Test Center; however, the damaged car is being repaired and will go to Chicago, Cleveland, Philadelphia, Boston and New York for demonstration as originally planned.

This fall, we anticipate having the Energy Storage Car designed with a flywell generator system aimed at reducing energy requirements by storing those energies normally disapated via resistors in a dynamic brake system.

Later, the Gas Turbine Electric Cars will be at the Test Center for test. They can be operated with wayside or catenary power or its own self-contained turbine power package aboard the car where commercial electric power isn't available.

(Slide #12) The last trackage I want to discuss, hopefully, has the most interest to you here today. This is the

Federal Railroad Administration's Conventional Rail Track. There are three major use categories of track in this particular facility.

The first track is the outer 14-mile High-Speed loop for 120-mph operation with current interchange type equipment and 160-mph operations with vehicles such as today's turbo trains and the Improved Passenger Train in the future. This welded rail track will be fully complete in September of 1974. Maximum curvature will be 0 deg. 50 min.

The second track category is the 5-mile Train Dynamics Track shown meandering inside the High Speed loop which was completed this June. This track provides grades and curvature paralleling the AAR Track-Train Dynamics program, where eventually 100-car freight trains can be instrumented and tested to better analyze and understand total train behavior. The track structure is 136-lb.-jointed rail on grade 5 wood ties spaced at 19½ in. centers. The ballast is slag from the CF&I Steel Mill in Pueblo with a 15-in. depth under the ties. Both major and minor geometric changes can be made for curve entry studies.

(Slide #13) The final 1 mile of trackage also completed in June of this year of identical construction is called our impact track. This track is the tangent track to the left of the TDT shown at center. This facility will be used to examine grade crossing situations as well as mechanical integrity of equipment such as hazardous material cars and studies involved with lading and damage prevention. In November, we will have the grade crossing test program under way for baseline crash data collection between an automobile and a locomotive.

(Slide #14) Presently, on the Train Dynamics Track, we are collecting extensive data on our GE U30C locomotive relative to validating Truck Computer Models. This unit has been regeared for 120-mph operation. Basic step input data is being collected on this TDT through specific irregularities. Additional information on ride quality and truck performance will be collected to 120 mph.

(Slide # 15) This next slide gives you a good overview of the major support facilities including the rather large steel framework at center for the Wheel/Rail Dynamics Laboratory. To the right of this is the Project Management Building where most of the paperwork gets done. To the left and in the early stages of construction is our Technical Services Facility perhaps once known as the "Roundhouse".

Getting back to the Wheel/Rail Dynamics Laboratory, this facility will have sufficient capacity to handle a complete spectrum of main-line railroad equipment in order to properly support railroad research and development programs. The laboratory will have equipment and control facilities to apply static and dynamic forces to total vehicles or components of vehicles. Analogous to those conditions occurring in service, freely and repeatedly; instrumentation which is superior to what can be accomplished in the field, and independence from operating environmental constraints and safety experimentation which verges on hazardous situations plus close visual observation are the advantages of such laboratory testing.

This capability will be used to conduct research in track characteristics, i.e., the effect of track variations on vehicles response, guidance, propulsion systems, and braking systems, and will provide a facility for shakedown and accurately documented specification compliance testing of new equipment plus the ability to restage accidents with independent sensitivity runs for the identification of casual factors.

The concept of the "roller rig" originated in the early locomotive dynamometer installations where wheeled vehicles were positioned over rollers that incorporated energy absorbing devices. These systems provided a means for "loading" the engines to determine their performance.

This concept has been expanded

upon in railroad research facilities in England, France, Germany and Japan in the last five to ten years. Provisions have been incorporated for moving the rollers up-and-down and sideways to simulate track irregularities. The resulting dynamic excitation is used to study the performance of vehicle suspension systems and the mechanics of rolling contact, as well as propulsion and braking.

The simulator system for the Wheel/Rail Dynamics Laboratory will be an advancement in the state-of-the-art and will provide the simultaneous simulation of all the various track irregularities experienced in the field, including track displacements under moving loads.

As you well know, I have only been able to touch the surface of the High Speed Ground Test Center facility at Pueblo, Colorado. I hope that I have been able to tease your technological appetite to the extent that you will eventually see the facility for yourself. The Federal Railroad Administration will soon be publishing a Facility Manual that will give you more technical details on the facility itself and the mechanics of becoming an actual user at the site. I do appreciate your time and hope to see you all soon.

Thank you.

President Bryant: Mr. Gill, may I thank you sincerely for the entire assembled members and guests for your up-to-date informative address on what we may reasonably expect rail transportation to be in the future. It has been an honor to have you speak to us today. Thank you very much.

Introduction of R. D. Shaver

President Peak: We are now going to come to a subject that we have to have at each of these conventions because it is very important in our work. We constantly talk about safety; we can never talk about it too much.

Our next speaker was born in Atchison, Kansas, and was a resident of that state until moving to Iowa in 1962.

After graduating from high school he attended the National Railway Police Academy and later the Institute of Business Economics in Southern California.

He began his railroad career as a special officer on the Santa Fe at Emporia, Kansas, in January, 1949. In August of that year he was appointed safety supervisor at Fort Madison, Iowa.

To him, the work in the Safety Department was most stimulating and his deep interest earned him rapid advancement, and after four years he became the superintendent of safety-system with headquarters in Chicago.

He is a member of the American Society of Safety Engineers and is also Chairman of the Association of American Safety Section, OSHA Committee.

Ladies and gentlemen, Mr. Richard Dean Shaver. (Applause)

Prevention Is the Key

By R. D. Shaver

Superintendent of Safety-System, Santa Fe, Chicago

Thank you. I thought I saw a couple of ladies here. Ladies and gentlemen, I want you to know it is really a privilege for me to be here this morning and get to talk to the backbone of the railroad industry. I have always had a soft spot in my heart for maintenance-of-way people.

It also is an honor and a privilege to be here to get to talk to you about one of the most important subjects that we can talk about in the railroad industry and that is accident prevention and safety.

Several months ago, when I was first transferred to Chicago as assistant superintendent of safety, Mr. Baird received, and incidentally he was then our superintendent of safety, and he received an invitation from Mr. Autrey to come here today and talk to you people. Unfortunately for the Santa Fe Railroad, as well as you folks here today, Mr. Baird had some unfortunate health problems which caused his premature retirement. Consequently, I decided to accept the challenge.

A few years ago in Kansas City a man received a threatening letter. The letter said, "Unless you deposit $25,000 at a certain place and time, we will kidnap your wife."

In response, the man wrote a note and took it to the place where he was to deposit the $25,000. The note said, "Do not have $25,000, but I'm very much interested in your proposition."

Now when Mr. Autrey wrote Mr. Baird and invited him to be here this morning, I felt I had to accept in his absence and give Mr. Autrey almost the same answer as the man gave the kidnapper in Kansas City. I don't have all the answers, but I'm sure interested in your proposition.

Must develop proper attitudes

Prevention is the key. Now so that everyone is on the same wave length and there is no misunderstanding, I'm talking about the prevention of accidents and personal injuries. There, of course, are many types of programs or methods to achieve this goal and unquestionably one of the most important ingredients is sincerity. The supervisor must be sincerely interested in accident prevention and safety. He must maintain a good, open line of communication. He must impress upon the worker there is a safe way to perform his duties. He must develop safety awareness in that employee in somewhat the same manner that it was developed in you, the supervisor. This should be accomplished in an endeavor to develop desirable attitudes.

Anyone associated with accident prevention realizes that unfavorable safety attitudes, lack of interest, inattentiveness, and worry, result in many accidents and painful injuries.

Therefore, if we are going to have a successful accident prevention program, it is important to develop in each worker a safety awareness which replaces that unfavorable attitude about safety.

In order to prevent accidents, the supervisor must be able to readily recognize a hazardous condition. He must be able to readily recognize an unsafe act and he must recognize that an employee, in many instances, creates these conditions.

There are several other important aspects in connection with accident prevention that I would like to briefly touch on.

Good housekeeping.

Personal protective equipment.

Inspection of equipment, tools and property.

Training programs.

And last, but not least, his listening.

Good housekeeping is an absolute must insofar as preventing accidents is concerned. The basic rule which good housekeeping plays, not only in eliminating various types of accidents, but also in fire prevention, in occupational health and protection of personnel.

The importance of the immediate cleanup of spills and control measures necessary in the use of toxic materials and harmful solvents.

Personal protective equipment. What personal protective equipment is supplied by your company for use in your particular department, where to obtain it and how and when to use it.

This also includes, gentlemen, the fact that the supervisor should not be without that same protective equipment when he is in those situations that require one of his men to use the equipment.

And I want to add at this point in reference to the new Occupational Safety and Health Act, commonly referred to as OSHA, and many other things that I'll not call it, just making the equipment available is not enough. You must see to it that the worker uses the protective equipment if he is in an area requiring protective equipment.

Inspection of equipment, tools, property or plant.

Not so long ago I had the opportunity to visit a mechanical facility, and I might add it was a rather small operation. And you would be completely amazed at the number of defective tools that we observed the employees using. Let me give you an example.

Out of 14 ladders, 7 of them were broken, either the rungs or the side legs. They were dangerous. Seven out of fourteen. And they were being used.

Hammers, mauls, sledges, with cracked or badly broken handles.

Gentlemen, you would also be surprised at the number of accidents that tools such as this cause and painful injuries from those accidents. That was mechanical.

Also in this inspection we found a large maintenance-of-way truck, relatively new. The tires were worn that you could see the threads. The side mirror was broken. The side glass was broken. The door handles on the inside of the crew cab were missing. The doors could not be opened except from the outside.

Now I didn't come here to be critical. I came here because I am sincerely interested in accident prevention and safety, and those things cause accidents. Not only can they be very, very embarrassing to all of us, they can be damned costly.

Training programs are a must and they are very, very important on our property. This is not only imperative to a good accident prevention program, but training improves production and reduces costs. And I'm not going to get into this subject because I think maybe you will hear more about it later on.

Must learn to listen

Listening. Some of you probably thought, "That guy's flipped his lid." Remember what Mr. Boyd said about the bird. He didn't speak up. Listening is probably one of the most important and probably the one that we most fail to comply with. I'm judging you from some of my personal habits and experiences.

Some years ago a psychiatrist by the name of Dr. Theodore Rieck wrote a book entitled, "Listening With The Third Ear." While Dr. Rieck was addressing himself mainly to his profession, the insight he furnished into the psycho-analytic process can prove useful to everyone, particularly to supervisors and accident prevention officers. And incidentally on our railroad every supervisor is an accident prevention officer.

I'm not trying to say here that we should all attempt to be psychoanalysts. Rather, it indicates that we should give the same care and attention to truly listening to another person as a psychiatrist does when he is working with a patient. Not only is that psychiatrist listening intently to every word, how it is being spoken, the tones and inflections of the voice, but most importantly he's attempting to assess how that person is feeling and what he really means by what he is saying. He listens with a third ear. He tries to establish a direct line of verbal and emotional comprehension between himself and the other person so that he knows exactly what it is that man is trying to tell him.

Listening with the third ear is like reading between the lines of printed material. Reading between the lines of spoken communications helps you get closer to what the other person is trying to accomplish through his verbal expression. When you listen the words may denote something to you that is entirely different from that which is meant by the speaker. Your inference from the connotations of the words may be different from what the speaker is implying.

So it gets back to asking the question, "Just what is it he is trying to tell me? What is the true message that he wants me to receive?"

How often have you heard a person try to explain something and finally say in exasperation, "Well, you know what I mean." You may or you may not know what he means. It depends entirely upon how adept as a listener you are. You must be tuned in on the other person's wave length. Being tuned in means that you are giving that other person your full attention. You are making an honest attempt to completely understand his meanings and feelings. You are sincerely interested in endeavoring to find out what that man's problem is.

Too many of us are only partially tuned in while we are in fact concentrating our thinking about what we are going to say. If the input information to both of you is faulty and inadequate, you can be well assured that the output will likewise be faulty and inadequate. There are many, many obstacles which will have to be conquered before your accident prevention program will really be successful.

I just want to touch on two of those obstacles.

Communication, which goes hand in glove with listening. In fact, you cannot be an effective communicator if you don't first listen.

No. 2 is involvement. In communicating the accident prevention and safety message it cannot be stressed strongly enough. In other words, our safety message must be supported by our actions. Many times we become so familiar with the work being performed that we tend to overlook a safety rule set up for employee protection and correct work methods.

Our involvement on the ground by observing work practices not overlooking rule violations or incorrect work methods, will open new channels of communications and drop the barrier of being safe just because the boss was around. A common bond of understanding of goals and accomplishment can be achieved and our accident prevention and safety program can be realized.

Can correct the cause

Statistics reveal that approximately 90% of all accidents are caused. They do not just happen. Then we must find the cause so that immediate steps can be taken to prevent them. If we all agree that accidents are caused, then the next step is to control the people having or causing the accidents, and work towards correcting this situation in an endeavor to prevent recurrence.

Now just in case I have lost some of you because so very, very many people feel that accident prevention and safety is such a boring subject,

I would like to take just a moment and talk about something that all of you dearly love. And if you stay around Chicago very long you dearly need it. That's money. Let's talk about dollars.

A good accident prevention program is the greatest bargain that any company or any organization can invest in. It is a known fact that men who are well trained and sincerely active in accident prevention also do a good job in production, quality, and costs. In addition to the importance of protecting our people from the pain and suffering of injuries, accident prevention is just good business. It prevents tearing up your ties, your railroad bed, which you are all interested in. The same fundamentals that protect people from injuries also prevent those accidents that tear up equipment, they destroy lading and product and waste materials, all of which is very, very costly.

Everyone is subject to accidents and having them or not having them usually depends upon the number of unsafe acts committed and unsafe conditions exposed to in a given period.

Many studies have been made which associate a large percentage of accidents with the so-called accident prone group of people. I for one feel that the lack of supervisory safety education and direction, employees' physical condition, and employees' mental condition very, very definitely can and do cause accidents. That, too, points up the importance of supervisory involvement. Gentlemen, it's a must.

Usually accident proneness is described as a combination of human abilities which make a person highly proficient in bringing about accidents, regardless of his environment. The immediate supervisor must be trained and educated to immediately and thoroughly check into the causes of all accidents in an endeavor to analyze and establish not only the cause, but the steps or measures to take for prevention.

And I might add here that the people on your railroad are no different from some of the people on our railroad and, thank God, they are in the minority—don't necessarily take the first story as being the gospel truth about an accident because many, many accidents are brought to the railroad.

Safety is an old subject

Accident prevention and safety are certainly not new to our industry. Just recently I came across an old railroad rule book dating back to the turn of the century. I was amazed by the frequent references to safety requirements, even in those days. It was also of interest to me to find between the years 1911 and 1915 the standard rule book recommended by the American Railway Association for its member roads underwent one slight but very significant change. The change I am referring to was the adoption of the very first rule in the Standard Rule Book with the following statement:

"Safety is of the first importance in the discharge of duty. Obedience to the rules are essential to safety."

I made a brief comment about OSHA earlier. I realize I didn't come here this morning to talk to you about the new Occupational Safety and Health Act. However, on the other hand I feel I would be somewhat remiss if I didn't just make a few comments concerning OSHA before I conclude.

Like it or not, today's employer is vulnerable to an alphabet soup of government regulatory agencies. Now this is not to say that they are anxious to swoop down on anybody, but, gentlemen, one accident, one complaint, one seemingly simple misunderstanding can open a Pandora's Box. Let me give you an example.

One out of five of all OSHA inspections are due to employee complaints. Mischief-makers? Not necessarily. In all too many cases the employee did not get satisfaction from his supervisor, so he wrote directly to OSHA. This is a lack of communication, in many instances.

This gets back to what I have previ-

ously said about communications and listening. Of course, we all know that we do have the so-called chronic complainer or mischief-maker, if you will, who likes to keep supervision up tight. And we don't need them to keep us up tight.

We also know that there are some standards in Occupational Safety & Health legislation that we and the railroad industry simply cannot live with. And that's where you come in. Don't be like Mr. Boyd's bird. Speak up. Because we need to know what those standards are that we cannot live with. However, by the same token, as I see it, for the most part, it is just good common accident prevention and safety sense. You can't tell me that when we get more people involved in accident prevention and safety, that we're not going to cut down on accidents, because I know we are.

Before I leave, I would like to leave you with one additional piece of unsolicited advice. Usually that's the kind you don't give a damn about. In your personal contacts with your employees you might even want to refer to them as "safety meetings." Let's talk about preventing accidents. Let's don't put all the emphasis on the cotton pickin' safety record. Let's let the employee know that you are sincerely interested in him, that you want him to go home in the same condition that he came to work in. Let's put it in the humane perspective. Accident prevention.

And just remember this, that every time an employee under your supervision, I don't care if you are a roadmaster, you are a division engineer, a general B&B foreman, or what you are, every time an employee under your supervision has or causes an accident, a certain amount of that responsibility lies with you. Somewhere along the line we failed. We not only failed that man, we failed his co-workers, but most importantly we failed that man's wife and children.

You will remember my topic was, "Prevention Is The Key." Not only will more involvement, more communication, more listening, prevent accidents—it will likewise prevent us being failures.

Thank you very much. (Applause)

President Peak: Thank you, Mr. Shaver, for a most interesting and informative talk on this most important subject. As he quoted from the old Rule Book, and I believe most of us have it in our new Rule Book, Safety is of the most importance in the discharge of duty.

I particularly want to emphasize what Mr. Shaver said at the end, if we talk to our people and let them think all we're interested in is that record, we're not going to be very effective in safety and accident prevention. If we let them believe that the company is interested in their health and welfare, we'll do a better job of accident prevention.

Our registration as of this minute—we have 235 Roadmasters, 96 B&B, 125 guests, for a grand total of 456. I think that's pretty good for the first morning. If we can keep up with that we'll have a record convention for a non-show year.

The Roadmasters will reconvene in this room at 1:30 P.M., and on schedule we have presentations on track inspection, training, reclaiming of continuous welded rail enlivened, I hope, by your comments and questions. I hope you will all be here if you are roadmasters.

The B&B will convene at the same time in the Beverly Room.

If you have not yet registered, this is a good time.

Do you have anything to add, Mr. Bryant?

The convention is recessed until 1:30 this afternoon.

. . . Recessed at 11:15 A.M. . . .

President's Report

By N. D. Bryant

Assistant Bridge Engineer, Construction & Maintenance, S.L.-S.F.

N. D. Bryant

It is a pleasure to call this 78th Annual Convention of the American Railway Bridge & Building Association to order and to welcome you to this 38th consecutive meeting in Chicago. As always, our visitors and guests are especially welcome. I would also like to remind you that the ladies are cordially invited to attend any of our meetings which may be of interest to them. You are urged to provide your wives with a copy of our program and extend to them my personal invitation to join us in our meetings.

One if the obligations of the President, as specified in our By-Laws, is to present an annual report "containing a statement of the general conditions of the Association." Our membership situation continues to be of primary concern to each of us, and rightfully so, because of a declining level of railway employment over the past several years. Our total membership has declined hand-in-hand with total railroad employment.

But a more optimistic picture is emerging today. It would appear that the low-point in membership has been reached and that it has leveled off, or perhaps has slightly improved. Our pool from which to draw upon for our members has not increased to the extent that we can expect to automatically acquire new members. So it behooves each of us to put forth more and greater effort to secure new members. It is only through the individual efforts of every member that your president next year will be able to report to you a dramatic rise in total membership.

Our financial picture continues to be the bright spot in the yearly report. Although inflation and rising prices has forced our country's economic experts to try various economic phases to stem the rising tide of inflation, your Association has been able to hold our yearly dues at the same figure it has been for several years—$7.00. Not only have we been able to hold the lines on dues, but we have been able to provide a service that was dropped many years ago. Beginning with the new Association Year, new members will be presented with Membership Certificates and those members who did not receive a Membership Certificate when they became members, will be furnished one upon request to the Secretary. Our Treasurer, Mr. W. H. Huffman, will present a complete financial report at our business session Wednesday morning.

Have you ever thought, or said to someone "Where do THEY get topics for THEIR Special Subjects Committee Reports?" This question must have arisen in the minds of many members.

The answer to this question is "YOU." Each year, at the close of the final convention session, your Executive Committee meets to begin plans for the next year's reports. The topics are chosen from replies to cards mailed to you the preceding October. These cards request you to suggest topics for reports, in which you are most interested. You can imagine the consternation and concern of the Executive Committee to receive only 30 to 40 replies from over 700 members. Of these few replies, only 10 to 15 suggested topics for reports are received. From these 10 to 15 suggested topics the 3 or 4 Special Subject Committee reports are picked.

I would ask, yes urge, each member to conscientiously take an active part in this, your Association. You will be receiving the cards for next year's subjects in a few weeks and your new Executive Committee will appreciate your prompt return of the cards with your suggestions and offers to serve on Committees. Won't you make a greater effort to become more active in the Association, and by participating fully, make it a pliable organization subject to your wishes?

It has been an honor and privilege to have served several years with the members of the Executive Committee. These devoted members have freely given of their time and efforts to continue the activities of our Association. The smoothly running programs that you have seen this morning and will see in the remaining two days of this 78th Annual Convention, is the direct result of many hours of work by these men. As previously mentioned, the Executive Committee will meet at the close of the Wednesday morning session, when the planning for the 1973-74 Association Year will begin. Through the following 12 months, these people will have countless meetings, travel thousands of miles and write reams of correspondence for the Association. This is unselfishly given by them in the interests of the A.R.B.& B.A.

I am honored to present to you the fine and devoted group of Officers and Directors who comprise the Executive Committee. Some of them are presently busy with convention details and because of this are unable to appear before you at this time. However, I shall ask each one present to please stand as his name is called and to remain standing until all members have been introduced. Will you please withhold your applause until all have been introduced.

Our Secretary, Mrs. Ann Wilson, is unable to be here at this time because of her duties at the registration desk, but she will be here for our business session Wednesday morning. Mrs. Wilson, in her efficient, competent and pleasant manner, is one of the motivating influences in our Association. Each of us rely on her for the myriad details of the Association business and she provides the continuity needed for continuing our affairs year after year.

Next, I should like to introduce to you, in alphabetical order, our three youngest Directors:

Mr. J. W. Davidson, assistant director bridge engineering, Burlington Northern, St. Paul, Minnesota. Jim is a member of our Membership Committee and is sponsor of Special Subjects Committee #2.

Mr. C. A. Hughes, assistant engineer bridges, Southern Pacific, San Francisco, California. Cal is a member of our Necrology Committee and is sponsor of Special Subjects Committee #3.

Mr. W. R. Hyma, bridge engineer-system, Santa Fe, Chicago, Illinois. Walt is a member of our Registration Desk Committee and is sponsor of Special Subjects Committee #1.

The next group of directors, the intermediate group, have served our Association a little longer and perhaps are better known to you. Once more, the introductions will be alphabetically. They are:

Mr. D. C. Gould, systems bridge supervisor, Union Pacific, Omaha, Nebraska. Don is chairman of the Resolutions Commitee and is a mem-

ber of the very important Advertising Committee.

Mr. W. S. Stokely, construction engineer, Illinois Central Gulf, Chicago, Illinois. Bill is chairman of the Registration Desk Committee, serves as a member of the Ladies' Entertainment Committee and is sponsor of Standing Committee #1.

Mr. W. C. Sturm, senior design engineer, Elgin, Joliet and Eastern, Joliet, Illinois. Wally is chairman of our Public Relations and Convention Greeting Committee.

Our Senior Directors, also alphabetically, are:

Mr. R. K. Corbett, general foreman, bridge & building/water service, Santa Fe, San Bernardino, Calif. Bob is chairman of the Necrology Committee and is a member of the Special Subjects Committee.

Mr. J. R. Iwinski, bridge engineer, Chicago & North Western, Chicago, Illinois. Jerry is chairman of the Committee so important to your ladies, the Ladies' Entertainment Committee, and is also a member of the Special Subjects Committee.

Mr. J. S. Pritchett, general bridge & building supervisor, Southern, Columbus, Georgia. Jim is chairman of our Membership Committee and serves on the Resolutions Committee.

Mr. W. H. Huffman, assistant vice president-engineering, Chicago & North Western, Chicago. Heine has served the Association for many years as Treasurer, and also is one of our esteemed Past Presidents.

Next is Mr. T. L. Fuller, engineer bridges, Southern Pacific, San Francisco, Calif., our immediate Past President. Tom has continued to serve our Association during this past year and we are truly grateful for his guidance and counsel during this time.

Mr. J. R. Williams, engineer bridges, Chicago, Rock Island & Pacific, Chicago, is our Third Vice President. Jack is sponsor of Standing Committee #2 and is also a member of the Convention Program Committee.

Our Second Vice President is Mr. J. J. Ridgeway, director engineering services, Bessemer & Lake Erie, Greenville, Pennsylvania. John is chairman of our Special Subjects Committee. It is through the hard work of John and his Committee that we can look forward to several excellent features in our meeting.

I previously mentioned the good financial condition of the Association.

This blue-chip condition is primarily due to revenues brought in by advertising in the Proceedings. The man who can take credit for shepherding this advertising for several years is our First Vice President, E. E. Runde, manager of construction, Illinois Central Gulf, Chicago. Erv is chairman of the Advertising Committee and has held this position for several years. He has most ably served our Association in this position.

You may now applaud this fine group. (Applause)

Thank you. Gentlemen, you may now be seated.

I should also like to give proper credit for services performed in behalf of the Association, to three gentlemen seated in the audience. Each of these gentlemen has served our Association in many capacities. They are each one Past Presidents. Without their work, our yearly conventions would grind to a halt.

First, I should like to introduce Mr. M. H. Dick, vice president & editor, Railway Track & Structures. Merwin has for many years been chairman of our Program Committee. It is largely the result of his efforts that we are able to see and hear such outstanding speakers and reports. He is also an Honorary Member of the Association. Merwin, will you please stand and be recognized. (Applause)

Next, I am honored to introduce to you, Mr. R. E. Dove. Bob is associate editor, Railway Track & Structures, Chicago. He serves on the Publications Committee and is directly responsible for publishing our Proceedings. He is an Honorary Member of the Associa-

tion and last year was awarded a Meritorious Service plaque by our sister organization, the Roadmasters' & Maintenance of Way Association. Bob, will you please stand for proper recognition. (Appluase)

The next gentleman whom I am privileged to present to you, was President of the Association in 1968-69, moved to immediate Past President 1969-70, and has continued to work many extra hours for our Association since that time. He is chairman of the Hotel Arrangements Committee and is on the Publications Committee, in which capacity he gets out the Association Newsletters. He also serves as our representative in the Joint Association. May I present, Mr. W. F. Armstrong, engineer of buildings, Chicago & North Western, Chicago. Bill, will you please stand and be recognized. (Applause)

It has been a privilege to have served as your Association President during the past 12 months. I deem it an honor to have held the office which has been held by so many honorable and distinguished gentlemen prior to this. I firmly believe that the American Railway Bridge & Building Association is the finest organization to be found, comprised of the most dedicated railroad people anywhere, and I thank you for permitting me to have served as your President in this organization.

Recognition of Past Presidents

The next item on the agenda is one which we look forward to each year—recognition of our Past Presidents. The introductions will be made by a man who is, himself, one of our Past Presidents. Will Mr. Bob Hellweg please step forward and give proper recognition to these esteemed gentlemen.

Mr. Hellweg introduced the Past Presidents.

President Bryant: Thank you very much Mr. Hellweg. It is always a pleasure to see so many of our past leaders in attendance.

We are now ready to commence presentation of our Committee reports and special features. Much hard work by many individuals have gone into the research and preparation of these papers. Special credit must go to the sponsors and committee chairmen for the Committee reports. It has been through their hard work in piloting these papers through the shoals of "inactivity", "failure to reply" and "proper editoring," that we can look forward to an enlightening and entertaining program.

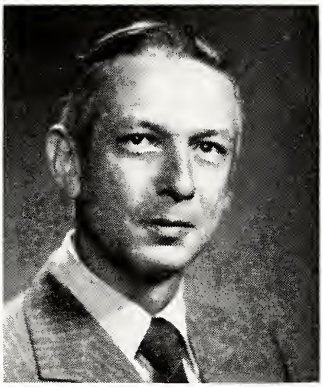
As you know, the papers to be presented here are the result of information received from a large cross-section of the railroading industry. However, there will be points presented that may not be clear to you, or with which you may disagree. In any event, you are urged to participate in the discussion following the report. If you have a question or statement regarding the report, please stand, announce your name and direct your remarks to the chairman.

Our first report is that of Special Subjects Committee No. 1—"Water and Air Pollution as Applicable to B&B Work." Mr. W. G. Byers, bridge engineer, Western Lines, Santa Fe Railroad, Amarillo, Texas, is chairman of the Committee. The sponsor of the Committee is Mr. W. R. Hyma. Will these two gentlemen and those Committee members present, please step to the platform.

Water and Air Pollution As Applicable to B&B Work

Report of Committee

COMMITTEE—W. G. Byers, *Chairman*, br.engr., A.T.& S.F., Amarillo, Tex.; W. R. Hyma, *Vice Chairman*, br.engr.sys., A.T.& S.F., Chicago; J. C. Hobbs, *Vice Chairman*, engr.trk.& struc., R.F.& P., Richmond, Va.; D. S. Bechly, asst.ch.engr.struc., I.C.G., Chicago; O. C. Denz, supvr.bldg.mtce., C.M.S.P.& P., Chicago; E. E. Franklin, steel br.insp., S.L.-S.F., Springfield, Mo.; F. F. Hornig, div.engr.(ret.), C.M.S.P.& P., Austin, Minn.; A. Matt, gen.fore.b&b&ws, A.T.& S.F., La Junta, Colo.; J. A. McFarland, pres., McFarland, Johnson Gibbons, Woodbury, N.J.; R. F. McGuire, Osmose Co., Shawnee Mission, Kan.; J. J. Ridgeway, proj.mgr., B.& L.E., Greenville, Pa.; E. E. Runde, mgrconst., I.C.G., Chicago; J. F. Schmitz, b&b supt., M.P., Little Rock, Ark.; and W. S. Stokely, sr. denr., I.C.G., Chicago.



W. G. Byers

The scope of this report will be limited to B&B construction and maintenance operations and will not include the treatment of sewage or of waste from shops and fueling facilities even though this is a B&B responsibility on some railroads. Although not mentioned in the title of the report, noise pollution will be discussed as its regulation has many characteristics in common with the regulation of water and air pollution. Both legal requirements relating to pollution, and techniques for reducing or eliminating pollution will be discussed.

Pollution control laws

The relationship between pollution and the law is relatively old. In his eighteenth century "Commentaries on the Laws of England," Blackstone included examples of water and air pollution in a listing of private nuisances. Until recently, the legal status of pollution has usually depended on the common law doctrine of nuisance which allows recovery of damage by an injured party or, in certain cases, the prevention of injurious activities by injunction.

At present, most pollution control is by statute or ordinance. In some cases, regulation is obtained by requiring permits for the discharge or emission of pollutants, with the character and quality of pollutants allowed being spelled out in the permit. In others, control is obtained by general limitations on activities and/or the quality of effluents. These limitations may be specified in the statute or ordinance or they may be specified by a rulemaking body created by the statute. The created rule-making body is usually more competent technically than the legislative body and is in a position to modify the regulations when required without a revision of the statute.

With the exception of the 1899 Federal Refuse Act which prohibits the discharge of any refuse matter into navigable waters and their tributaries, early pollution control legislation was primarily state legislation. The 1948 Water Pollution Control Act was the beginning of modern federal pollution control legislation. A period of increasing federal activity in air and water pollution control matters eventually leading to federal pre-emption in sev-

eral areas and federal domination in other areas began in 1956.

The Federal Water Pollution Control Act as amended in 1972 establishes as one of several goals the elimination of the discharge of pollutants into navigable waters by 1985. It also states that "it is the national policy that discharge of toxic pollutants in toxic amounts be prohibited." It has been the apparent policy of federal control agencies to require that state water quality criteria preserve or improve the present quality of all steams regardless of how high the present quality may be.

The fundamental law governing air pollution control is the Federal Clean Air Act which allows states and political sub-divisions to adopt or enforce standards or limitations respecting emissions of air pollutants and requirements respecting control or abatement of air pollution only as long as these standards or limitations are not less stringent than the standards or limitations in effect under any applicable, federally approved implementation plan. Pollutants that are not carried off the property where they are produced may be under the jurisdiction of an agency having responsibility for occupational safety and health rather than under the jurisdiction of the air pollution control agency.

In addition to regulations related to the quantity of pollutants of various types discharged into the air, most states have regulations governing visible emissions which are related to the appearance of the emission rather than to the actual quantity of material discharged. Regulations for visible emissions are usually based on the Ringlemann Chart for black or gray smoke or on equivalent opacity for emissions of other colors. The Ringlemann Smoke Chart consists of a series of rectangular grills of black lines of definite width and spacing on a white background which, when viewed at a sufficient distance, produce graduated shades of gray, varying by five equal steps between white and black. (Copies of the chart are available from the Publications Distribution Branch, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pa. 15213.) The usual limit, except for short periods of time, is Ringlemann No. 2 or 40% opacity. However, some states have a limit of Ringlemann No. 1.

The Noise Control Act of 1972 requires regulations for new construction equipment which will probably become effective by the fall of 1974.

Planning and executing work

In planning B&B work that might produce air or water pollution, consideration should be given to the various laws and regulations that could affect the work. This is particularly true when the work will be in progress for a considerable period of time or at a location, such as a populated or recreational area, where pollution would be particularly objectionable or where the more obvious, although not necessarily more serious types of pollution would be readily observed by the public.

In addition to complying with limitations on activities and/or effluent quality, it may be necessary to obtain operating permits. Although the permit procedure is generally designed for fixed sources which will be operating for extended periods of time, there may also be a legal requirement to obtain permits for movable sources. Before moving a source of pollution into a state for operation, it would be advisable to determine what, if any, registration or permit requirements exists in the state.

In some cases it may be possible to obtain variances allowing activities that would normally be prohibited by regulations. In general, a period of 90 days or more will be required between the time an application is filed for a variance and the time the variance becomes effective.

Work over or adjacent to a stream which could result in any discharge into the stream may require a permit from the Environmental Protection Agency. If an EPA permit is required, applica-

tion for the permit must be filed 180 days before the effective date of the permit.

Before starting work, the general area should be checked for the existence of pollution problems which, although not related to the work, might be blamed on it. In particular, the presence of dead fish or an oil film in streams should be noted and an attempt made to determine the source of the problem before work is started. Any damage to vegetation in the area should be noted.

Certain precautions, of a general nature, should be observed during the course of the work. Some activities which produce air pollution may have to be suspended when wind or other atmospheric conditions are adverse. In areas subject to severe air pollution, the possibility of having to suspend work during an air pollution emergency should be considered in scheduling. In addition to stream pollution by direct discharge of objectionable material, the possibility of pollutants being carried into the stream by high water or local runoff must be considered.

Visible floating material, oil slicks and fish kills are likely to result in prosecution or damage claims. If dead fish are observed downstream from the location of the work, an immediate check should be made upstream as the fish kill may be the rsult of conditions unrelated to the work and the presence of dead fish upstream would be evidence of the unrelated cause. Fish kills are usually the result of oxygen depletion in the stream or poisoning of the fish. B&B work is unlikely to cause oxygen depletion but may result in the discharge of toxic materials into the stream. Samples of the dead fish and water should be obtained for analsis and must be analyzed promptly as they deteriorate and become useless if they are not. Game fish living in clear streams and lakes are more readily injured by pollutants than many other species.

Water pollution

In general, building work does not produce serious water pollution problems since the small quantities of pollutants involved only enter natural water courses through storm runoff and become diluted and mixed with a variety of other pollutants from the area drained. In the case of bridge work, however, the potential for direct discharge of pollutants into the stream exists together with the possibility of material being washed from the banks adjacent to the stream.

One of the major problems is the entry of wood preservatives into streams. Since all wood preservatives are more or less toxic, the presence of dissolved or suspended preservatives in the water is always objectionable. Some of the most difficult problems arise from in-place treatment of piling. Considerable work has been done on methods to control or prevent pollution from this source.

In-place treatment of timber bridges was started 20 years ago, and in the last 10 years has become an accepted maintenance practice. People concerned with in-place treatment recognized from its beginning that indiscriminate use of preservatives could result in water pollution and methods were developed to protect water under subject bridges from pollution.

From 1953 to 1963, pollution controll methods included diverting small streams away from piling, damming small streams until after treatment, using polyethylene drop cloths over water during treatment and scheduling treatment during the dry season. From 1963 to 1970, these methods were continued and use of an alternate preservative over water was introduced. Since 1970, the alternate preservative has been used on the small percent of piling where mechanical water protection devices will not work due to decay location and, where possible, mechanical devices have been attached to the bents to keep all the preservative out of the water.

The use of mechanical devices on

bents over water has proven to be the best method of preventing water pollution during in-place treatment. A detailed description of the water protection devices and procedures follows.

After the piles have been bored and decay measured, metal discs are attached around each pile about one foot above the average water line. A highly absorbent material is stapled around the pile just under and touching the metal disc. A quick-setting cement grout is poured into the area where the edge of the metal disc touches the pile. In about 30 minutes the grout is set-up to seal the disc to the pile. Two men internally treat the bent through the holes drilled for the inspection, one on each face of the bent. One man does the actual treating while the other is opposite him watching for material that may be flowing from the pile through checks, bolt holes, etc. This man blots up any heavy flow of material. If he misses any it will be stopped by the metal discs attached to the piling below.

After the cap has been bored and any decay measured, a polyethylene wrap is applied along both sides and ends of the cap with staples. The poly is slit down the left side of each pile and wrapped under the cap. The end is stapled to the adjacent pile. This is done on both faces of the bent. The poly is now attached in such a way as to catch any material flowing out of the cap during treatment and divert it to the pile. The internal treating nozzle is pushed through the poly wrap and each inspection hole in the cap is treated. Material flowing out of the cap during treatment is diverted by the poly wrap to the pile. If the flow is heavy, it will be caught by the disc below before it goes into the water.

Treated timbers or piles carry varying amounts of preservative on their surfaces. The use of straight creosote treatment followed by solvent cleaning instead of treatment with creosote petroleum mixtures reduces the risk of preservative leaching into the stream but probably also reduces the effectiveness of treatment. In some locations, the use of steel or concrete piles may be required to eliminate water pollution problems. In addition to preservative leaching from piling, creosote dripping from deck timbers has resulted in at least one citation for water pollution.

Chips and sawdust from framing timbers can result in floating material which is esthetically objectionable and, if the timber has been treated, the introduction of preservatives into the water.

Abrasive blasting can introduce paint pigments into the stream and, in some cases, the quantity of grit deposited becomes objectionable even if the material is non-toxic. One bridge-painting job was stopped because of such pollution. Limits on the quantity of heavy metals, including berryllium, cadmium, chromium, lead and zinc, present in streams are specified in many water quality criteria. Several of these metals are present in commonly used paint pigments. In addition to toxic pigments, the application of paint can introduce objectionable solvents into the stream. When working over water, over-spray and spillage of paint should be carefully controlled.

Although not introducing any material other than that normally present in the bed of the stream, excavation may increase turbidity to an objectionable degree. In clear streams, excavation procedures, such as drag line excavation through water, which tend to mix the excavated material with the water may have to be avoided. Concrete placement in running water may result in leaching of cement from the concrete mix. The use of tight forms and the driest practical mix will minimize this problem and also result in better concrete.

Although technically simple to control, poor housekeeping practices can be a significant source of pollution, usually of the most obvious kinds.

In case of accidental spills, the proper authorities should be notified immediately. This is particularly important in the case of spills of toxic material into streams that are

used as a source of municipal water supply or drinking water for livestock.

Air pollution

A number of normal B&B operations involve possibilities for air pollution. Those involved with the painting cycle are probably the most important if the frequency with which the work is performed and the pollution potential are both considered. Painting can produce air pollution during both the cleaning process and the application of the paint.

Abrasive blast cleaning which is the most effective method of surface preparation prior to painting can produce appreciable air pollution. Dry sand blasting has been a standard procedure for some time. Air pollution from dry sand blasting is caused by dust resuling from abrasive particle breakdown and from the material removed. The material removed may be particularly objectionable since red lead and some other pigments are toxic. The dust from particle breakdown can be reduced but not eliminated by using silicon carbide or aluminum oxide abrasives instead of sand. Wet sand-blasting virtually eliminates the dust problem and is required in some areas. Direct pressure dry sand blasting equipment can be converted to wet sand blasting equipment by use of an adapter which adds water to the abrasive stream at the discharge point. As an alternative to sand blasting, hydraulic blasting does not produce any air pollution problems but is much more hazardous because of the high pressure jet used.

The application of paint will result in a greater or lesser degree of air pollution depending on the method used. The greatest amount of pollution is produced by spraying with an air-atomization type spray gun. When flat panels are sprayed with this type of equipment, a typical value for overspray is 60% as compared o 35% overspray for "airless" equipment. Brush application eliminates the overspray problem but does not eliminate pollution resulting from evaporation of solvent. Solvent vapors contribute to the production of photo-chemical smog and in some areas solvents with high boiling points (above 223 deg. F. in Los Angeles) may be required unless the chemical composition of the solvent complies with severe limitations. Paint with high boiling point solvents is available but is very slow drying. In addition to solvent vapor problems, lead compounds and some other pigments are toxic and are discharged into the air when paint is sprayed. This may result in restrictions on the spray application of paint.

Applying tar and gravel roofing or bituminous waterproofing involves heating the bituminous material. This produces odors which are objectionable in certain localities and, if the material is heated excessively, smoke may be produced as a result of vaporization and, if heated above the flash point, ignition of the bituminous material. The flash point of coal-tar pitch is about 250 deg F and that of asphalts between 350 deg F and 450 deg F. When bituminous material is being heated, the size and temperature of batches should be carefully controlled.

Woodworking operations may produce airborne sawdust but this is generally not a serious problem except in shops where a large volume of sawing and sanding is performed. Windblown sawdust might become objectionable in urban areas.

Concrete batching is also a potential source of dust problems. Dust from dry aggregate can be eliminated by wetting before dumping and allowing the aggregate to drain in the stockpiles to approach a saturated surface dry condition. If batching is one with sacked cement and the cement is handled carefully, little cement dust should go into the air. There should be a minimum free fall of cement when the sacks are dumped. If bulk cement is used, dust control equipment may be required.

Demolition of structures with masonry or plastered walls will result in

appreciable amounts of dust unless the structures and piles of debris are kept wet. It may also be necessary to wet the loads of debris before hauling them from the structure.

Dust from access roads can be controlled by sprinkling or by applying calcium chloride to the surface of the road. Dust from dumping ballast can only be controlled by controlling the quality of the ballast. Hard ballast with a small percentage of fines will produce relatively little dust. It may be necessary to suspend dust-producing operations when wind velocity is high and the wind is in a direction that will carry dust to developed areas.

The exhaust from gasoline and diesel engines is a source of pollution but is usually controlled by federal or state regulations on the design of pollution-control equipment for the engine. Pollution-control equipment must be kept in operating condition. Exhaust from diesel pile hammers or smoke from boilers for steam pile hammers may produce smoke darker than that allowed by applicable regulations. The smoke from steam boilers can be reduced or eliminaed by proper firing. Little can be done to reduce the density of exhaust from diesel pile hammers other than proper maintenance of the hammer and proper fuel selection.

Flame cleaning metal structures, oxygen acetylene cutting and welding may produce metal fumes and fumes from the vaporization of paint pigments. Some of these fumes, e.g. those from lead base paints, may be toxic. In general, the quantity of fumes produced by these processes is so small that they will not produce a problem off the right of way. However, workmen involved in these processes should be protected from toxic fumes by proper safety equipment.

In many areas, the burning of refuse from construction operations is either prohibited or strictly regulated. Where burning is allowed, care should be taken to manage the fires so that unnessary dense smoke is not produced.

Noise

In addition to Federal regulations on noise-producing construction equipment, there are local ordinances and regulations affecting noise from construction work. The most prevalent type of regulation prohibits noise-producing work at night and may restrict areas where noise-producing equipment is allowed. Except in urban areas, operations that do not produce a noise level requiring protective equipment for the employees involved will probably not create any problem during normal working hours because of the rapid decrease in sound intensity with increasing distance from the source.

Where noise reduction is necessary, substitution or modification of equipment may provide an answer. Vibratory pile drivers produce less noise than types depending on impact but may not be suitable for some pile driving conditions. Internal combustion engines should have adequate mufflers kept in good condition.

Where equipment substitutions or modification will not adequately reduce noise levels, it is sometimes possible to reduce the noise level by changing construction methods. Riveting and tightening of bolts with impact wrenches produce considerable noise. On the other hand, welding is a relatively quiet process. Where only a small number of bolts need to be tightened, they can be tightened by hand, using a ratchet wrench with a handle of adequate length although this is much less efficient than the use of impact wrenches.

Summary

Compliance wih the various pollution control regulations produces additional, but not insurmountable, problems for the supervisor in charge of planning and executing B&B work. Additional lead time may be required to obtain permits. Methods and materials may have to be changed to reduce pollution, and these requirements must be considered in planning

the work. During progress of the work, close supervision is required to prevent citation for violation of regulations and to obtain information for defense against prosecution for alleged violations that do not, in fact, exist.

President Bryant: Thank you, gentlemen, for an interesting and informative report. You are now excused with the thanks of the Association.

Our next feature is one which is both timely and educational. No doubt each one in this room today is familiar with bridge failures, or incipient failures, caused by streambed scour or other underwater conditions. Had someone been forwarned, had they been able to see what was occurring below the water surface, the failure could have been avoided. Mr. Robert J. Whitman, who is president of Entcor, Inc., will speak to us on the "Advanced Techniques of Underwater Inspection and Photography".

Mr. Whitman was born and raised in Rochester, New York. He graduated from Virginia Polytechnic Institute in 1947, with a B.S. degree in Industrial Physics and upon graduation joined Eastman Kodak in Rochester, N.Y. He rose from the position of development engineer to technical associate, responsible for the development of advanced film testing systems and equipment.

He left Kodak in 1970 to join his present Company, formerly Seatech, Inc. as vice president for R & D. In July 1972, he was elected executive vice president and then in January 1973, he became president & chief executive officer. Mr. Whitman, it is my privilege to welcome you to our Association meeting.

Advanced Techniques of Underwater Inspection and Photography

By R. J. Whitman

President, Entcor, Inc.

The need for new underwater inspection techniques first came to my attention in a round-about way. Back in 1967 or 1968, I was a member of a sport-diving club consisting entirely of engineers and technicians at the Eastman Kodak Company in Rochester, New York. The objective of the Club was to organize diving activities such as searching for ship wrecks.

Although we were never so fortunate as to stumble upon a pirate galleon bulging at the seams with jewels and boullion, we did locate the remains of a badlly deteriorated, nondescript coal freighter on the bottom of Lake Ontario. Having been well trained at Kodak in the value of recording momentous occasions on film, we dutifully went about the task of photographing the miscellaneous timbers and steel parts that laid half buried in silt.

The resulting pictures resembled coal dust suspended in a cup of black Sanka.

Undaunted we spent the following winter months devising and constructing special techniques and equipment to clear the water in front of our camera lens prior to snapping the shutter. Came Spring and we were ready for a field trial. Our first pictures with the new equipment were of some pier pilings in the muddy Genesee River. They were extremely clear and detailed. Eureka! We now had the capability of taking detailed photos of our submerged treasures no matter how murky the water. Our success as underwater photographs spread rapidly . . . among our wives and parents and very close associates. We had to find satisfaction in our achievement only from the added pleasure it brought to our underwater sport.

Rochester, New York is not exactly a haven for commercial divers. The yellow pages of our local telephone directory at that time listed only one name under the heading of divers. And that one gentleman—whose name as I recall was Jim—found it necessary to supplement this diving income with a full-time job at Kodak. One day he received a phone call from a New York City consulting engineering firm who had been commissioned to repair a highway bridge across the Genesee River in Rochester. Jim did not want the job for some reason so he referred the call to our diving club. Needless to say we were very excited over the prospect of applying our new technique to a practical situation (and pick up some beer money at the same time). To our surprise and consternation the engineers were not particularly enthused about buying pictures of the bridge piers. "Just tell us how they feel", they requested. Dramatically we responded: "If you hire us you will get good pictures from which you can make your own judgement". Somebody else got the job.

We were completely disillusioned by this attitude of the engineering fra-

R. J. Whitman

ternity—based upon our sampling of one—and we resolved to make the world aware of the potential value of quality underwater inspections. And so our company had its beginning. We are now more than four years old and we are still trying to spread the gospel of professional underwater inspections to consulting engineers, municipalities, utilities, etc.

I appreciate this opportunity to speak to you on the subject.

Would a physician attempt to make an accurate diagnosis of pneumonia without a good chest x-ray? None that I would go to. Is it any easier for an engineer to accurately evaluate the condition of a bridge without the aid of a thorough, photographic underwater inspection? Yet, many engineers are continually attempting to do just that. In my opinion they are gambling with the safety and welfare of the public as well as making their jobs much more difficult. Modern diving and underwater photographic equipment make thorough inspections possible in almost any water and at a reasonable cost. Let me describe some of the equipment and techniques that are available.

Water is not clear

Way back in 1893 a Frenchman named Louis Boutan made the first successful underwater photographs. He used a large waterproof camera housing with a rubber bladder for pressure equalization. One problem he was not able to solve was the degrading effect of water turbidity. Even relatively clear water contains enough particulate matter to scatter the light with disastrous results.

At the turn of he century another Frenchman named Etianne Pean was attempting to overcome this problem by use of a "clear-water box" in front of his camera. Many variations of this basic idea have been patented and tried over the years with apparently little or no success. Other people have tried pumping clean water around the subject while still others have tried enveloping the subject in a bubble of air. As you might guess both of these schemes proved impractical.

If artificial light is the main source of illumination of an underwater subject, much of the scattered light can be prevented from reaching the camera by proper positioning of the light source. We have had some success by illuminating the subject from the side; that is by making the angle between the camera and the light source greater than, say, 60 degrees. In this situation two lights are generally needed, one on either side of the subject, to prevent dark areas void of any detail. It is important, however, that one light source be either closer to the subject or brighter than the other to provide some shadowing which enhances the surface texture and detail.

Of course, if surface light is the major source of illumination, little or nothing can be done about the angle of the illumination on stationery objects such as bridge piers and structures. In actual circumstances, seldom do we find the water clear enough so that surface light becomes a consideration.

Artificial illumination can come from several sources: (1) Incandescent lamps powered either from the surface or from self contained batteries; (2) chemical flash bulbs and (2) electronic flash "strobe" lamps. Surface-powered lamps have an obvious disadvantage of limiting the mobility of the diver, while battery-powered lamps seldom provide enough illumination. Chemical flash bulbs are generally used by sport divers because of their low cost and ease of use. We do almost all of our underwater still photography with strobe lights of various sizes. They provide the maximum mobility, light output, and convenience. Some models have adjustable light output as well as an adjustable beam width.

Many fine underwater cameras are commercially available today as are water-tight cases for dry cameras. Still cameras designed specifically for use underwater are the most compact and convenient to use and for that reason are used exclusively by our inspectors. We happen to prefer the Nikonos but there are other good makes.

For underwater movies we use a Cine' Kodak K-100 16mm camera in a water-tight pressurized housing. Although we have not yet tried one, I believe that the Kodak XL Super 8-mm movie cameras with automatic exposure control might prove very applicable to underwater photography. They would, of course, have to be enclosed in a water-tight housing.

No application for movies

Incidentally, we have yet to find a good application for motion pictures in underwater inspections of structures. Good still photographs can be enlarged for careful scrutiny; they can be pasted together to form a montage of a larger structure; they can be drawn on or scaled from; and they are easily filed with a report for ready reference.

All of our underwater photographs are made on 35-mm film—either Kodak Plus X for black-and-white or Kodak High Speed Ektachrome Daylight for color transparencies and prints. The choice depends upon the job and the

customer's preference. In general, for inspections of existing structures where marine incrustation, corrosion, erosion and so forth is of great importance, we recommend color. For inspections of new construction, where the photographs are to be used for the certification of proper assembly of joints, bolts and so forth, black-and-white is generally recommended because the photographs can be available within minutes.

All of our inspectors are trained to process both black-and-white and color film by hand when necessary. Many times we have turned a motel bathroom into a color photo lab. Black and white negatives are frequently processed aboard our boat so that we can confirm the results before leaving the site.

Perhaps something should be said about the diving gear. When I mention the word "diver" chances are many of you visualize a rugged seaman garbed in a canvas suit with lead shoes and a heavy steel helmet, dangling from the end of a cable. The fact is that such an outfit has little place in the underwater inspection field. Inspectors need the freedom to swim over, under, around and even through the pipes and structures they are inspecting. This type of mobility is best obtained by use of modern gear. If the job requires, for expedience or safety, an unlimited air supply, which must be supplied from the surface, modern lightweight helmets are worn with the same rubber suits and fins used for scuba diving. A great deal of mobility is still maintained.

Two basic types of dive suits are used, a so-called "wet suit" and a "dry suit." Both are made of a special cellular rubber, lined on one or both sides with nylon fabric. The wet suit, as the name implies is not intended to keep the diver dry, but rather it is designed to trap a very thin layer of water next to the skin which is quickly warmed by body heat. The dry suit, in the other hand, does keep the diver completely dry. It can be worn over a special insulated undergarment or even over street clothes for greater warmth in cold water. An additional feature of great significance to the underwater inspector is a provision for the diver to adjust the buoyancy of the suit using air from his breathing air supply. This enables him to accommodate easily to working at varied depths as is usually the case in making thorough underwater inspections.

Work in pairs

Scuba divers are generally not tethered to the surface and cannot depend upon anyone topside for help if trouble occurs. For this reason, they work in pairs and each depends upon his buddy for his safety. Often a third man called a divemaster is on the surface tending the boat, keeping time and generally supervising the operation. He also records the observations and measurements relayed to the surface by the divers via wireless transmitters.

Some of the miscellaneous items the divers wear or carry underwater are: Inflatable bouyancy vest, knife, depth gauge, compass, chipping hammer for testing the soundness of concrete and steel, measuring tools and gauges, and last but certainly not least, Entcor underwater inspectors carry proprietary water clearing equipment which enables them to see clearly and to photograph what they are inspecting.

A few words about the personal qualifications of an underwater inspector. No watter how capable a diver his is, no matter how good is his equipment, an underwater inspector just cannot do a first class job if he does not understand something about the structure he is checking, if he cannot distinguish between significant and trivial observations.

It is customary for the inspectors on dry construction projects to be either young college graduates or people with a great deal of field experience on civil engineering projects. Why should the underwater inspector be anything less? In fact, because of

the additional problems that are always encountered with marine construction, we believe that a thorough underwater inspection is even more difficult and more essential than inspections on land. Perhaps the underwater inspector should be more qualified than his land locked counterpart.

I've spoken thus far of the techniques of underwater inspection. What about the applications? I believe the best way to discuss these is by showing you typical photographs from actual underwater inspections that my company has performed. The list of possible applications goes far beyond what I will discuss here this afternoon. It is limited only by your imagination.

(25 slides were shown)

President Bryant: May I express the appreciation of our Association, Mr. Whitman, for your most interesting report. Thank you so very much.

This concludes our session for today. We will convene in the Williford Room tomorrow morning at 9:30 A.M. for our Second Joint Session with the Roadmasters. This session is now adjourned.

MORNING SESSION

Tuesday, September 18, 1973

The Tuesday Morning Session, September 18, 1973, was called to order at 9:35 o'clock.

President Bryant: Ladies and gentlemen, it is a privilege and a pleasure to present to you the first speaker for the joint session today, our second joint session. In over 30 years of railroading experience, all with one company, he has acquired a reputation as a railroader.

His railroading career began on the Frisco in 1941, where he started as a brakeman, and he advanced to various positions in the Operating Department to become president and chief executive officer in 1967. During this time he attended American University and Columbia University, studying Transportation and Business Administration.

In addition to his many duties as president and chief executive officer of the Frisco, he also serves as a director of the AAR, the Transportation Association of America, State Chamber of Commerce, a Trustee of Drury College. He is a member of the Executive Board of the Boy Scouts of America.

He's on the Governing Board of Railway Systems and Management Association.

He is active in the United Fund.

And he plays a leading part in guiding many other clubs and organizations.

Although his experience has been primarily in the Operating Department, he is one of the most knowledgeable of any chief executive officer in the country on maintenance-of-way problems and procedures.

How a person who is active in so many organizations could find time for recreation activities will always remain a great mystery. But in spite of business pressures this gentleman manages to find time to encourage and participate in the Frisco Annual System-wide Golf Tournament. I am told he is quite a respectable golfer.

Ladies and gentlemen, it is an honor to present to you the president and chief executive officer of the St. Louis-San Francisco Railway Company, Mr. Richard C. Grayson. Mr. Grayson. (Applause)

Money Makes the Mare Go

By R. C. Grayson

President, St. Louis-San Francisco, St. Louis, Mo.

Thank you very much, Darrell, for that generous introduction, which was pretty much as I wrote it for you. (Laughter).

I think I should first explain to you, as I did to Mr. Winters, that I am here because of my position and not because of my ability as a public speaker. I will leave that part of the program to Mr. Winters.

I have to speak from the notes that I have here, in fact, almost word-for-word, what someone has written down here for me, which I have edited, but I'm sure he'll speak right off the cuff. You see, we come from different training. As I understand it, he is a fabulous Minister and our accountability is somewhat different. (Laughter). I have to be sure what I have said because I doubt I could talk fast enough to get out because of some things I might say if I spoke without notes.

I am also going to leave the story telling to you, Dr. Winters, because, first if all, I get paid to run a railroad and not as a comedian. You don't hear many funny stories in our business these days because there really isn't much comedy mixed up in it. It is a very serious thing. We are probably in some of the most serious times in the history of our industry right at this moment.

I do appreciate what Darrell said. I appreciate the problems and feel at home among maintenance of way people, those who fix the track and fix the bridges. I think there is no question but what they are the most dedicated and the most loyal group of employees we have. In fact, when I accepted Darrell's invitation to speak to you today, I really had no idea the Frisco would owe such a debt of gratitude to the men who maintain our railroad and structures.

R. C. Grayson

When I accepted Darrell Bryant's invitation to speak to you today, I had no idea that the Frisco would owe such a debt of gratitude to the men who maintain our roadway and structures. This spring the Mississippi Valley experienced its worst flood in 200 years and the Frisco's railroad line between St. Louis and Memphis, which parallels the Mississippi river, was completely inundated. A group of us flew over the line in the latter part of April and the only visible railroad appurteances were the crossarms on the top of of the telegraph poles. With the exception of forty hours in late March, that portion of our railroad was out of service from March 13 to May 23.

The only access to the submerged line was via the river itself. Our maintenance forces enlisted the help of a barge line to float huge boulders right up to the submerged shoulder of the track. The boulders were then dumped to prevent the trackbed from washing

away. As the water began to recede, our maintenance forces worked around the clock trying to make repairs. . . . Only to have the water rise again within a few hours.

Before we got that particular line open, we had used some 400 carloads of ballast, 360 carloads of boulders and an additional 5800 tons of boulders which were delivered by barge.

Farther south, the Tombigbee river rose above flood stage, completely disrupting all service between Memphis, Tennessee, and Birmingham, Alabama, for five days . . . and preventing us from entering Mobile, Alabama, for eleven days and Pensacola, Florida, for nine days. On one occasion, the piers of one of our bridges on our line to Mobile were badly undermined by scouring action and the span collapsed . . . just moments after a train had passed safely over it.

Throughout this trying period, our maintenance forces performed admirably and I think this is an appropriate forum before which to compliment them publicly for the job they did.

A sizable part of the first main line railroad mileage in the United States is equipped with heavy rail, 34,000 miles of which are of the continuously welded type, and every effort is being made to upgrade secondary main lines to meet the higher standards promulgated by the Federal Railroad Administration. But it takes more than a directive or a regulation to improve the track structure. It takes money. So, for some lines it is going to be nip and tuck. The costs of maintaining a strong first main line have risen sharply in recent years and the additional expense of upgrading secondary lines makes it incumbent upon the rail carriers to get the most for their money.

In this process we no longer can afford the luxury of maintaining unnecessary branch line mileage. Every railroad has some unneeded trackage which ought to be abandoned. But the procedures are slow and cumbersome. In 1960, for example, the Interstate Commerce Commission recommended abandonment of 1200 miles of the now bankrupt New Haven Railroad. Fully 80% of that Company's freight revenues are generated by only one-third of its total mileage. By 1972, 12 years later, the New Haven had been successful in abandoning only 235 of those 1200 miles.

There are any number of ways in which rail abandonments can be delayed and often prevented: by regulatory authority, by court action and lately by the necessity of proving that the discontinuance of rail service will not result in an increase in pollution or ecological damage.

The fact that there is a great deal of excess rail mileage has been recognized by the I.C.C. and by some members of Congress. Several changes in abandonment procedures, aimed at allowing railroads to abandon some of their little used lines, have been proposed. As of now, none has been approved.

We continue to operate under the same old rules that force us to continue operation of thousands of miles of the national rail system at a substantial deficit.

The abandonment of unneeded branch lines will free cash for improving the more essential parts of our fixed plant. Yesterday's standards for maintaining roadway and structures will not meet tomorrow's conditions. Our roadway and structure standards have to be related to the job they are intended to perform. More powerful locomotives and the larger cars of today are moving heavier tonnage and are being operated at much faster over-the-road speeds that they were twenty years ago. The standard crosstie and ballast type of track support has served us well since the beginning. It has been greatly improved over the years. At this point in time, no other type of track structure has as yet proven itself to be better. Nevertheless, the track over which trains will operate in the years ahead will have to carry still heavier loads at faster speeds. It will have to stand up longer with a minimum of maintenance. Economics will

dictate a reduction in man hours to offset increased unit costs of labor.

Consider what has happened since the end of World War II. Maintenance of way wage rates increased four and one-half times between 1947 and 1972. Mostly because of a decline in passenger operations. Gross ton miles decreased 4.4% in the same period. But man hours devoted to maintenance of way and structures declined 72%. Better machines and methods have made the big difference. But better metallurgy and materials also have played a part. In building a better fixed plant, construction and maintenance forces will have to decide what kind of track structure is best suited to the present and future system in which it is to be employed. You will have to select on the basis of what type of track structure results in lowest total cost. . . . Considering first costs, maintenance cost and the sum of all related costs of moving tonnage over the track.

The major problem in railroading today is to find capital. We have any number of worthwhile improvement projects which could be undertaken to improve both plant and equipment. But when railroads enter the money market to raise capital, they have to compete with far more profitable enterprise with excellent credit ratings.

In recent years, the decline of rail earnings, the protracted reorganization proceedings involving financially troubled railroads, and the pauperized state of much of the industry have done little in inspire investor confidence. In the most recent bear market, even the stocks of railroads of proven profitability have sold for as low as six, seven or eight times earnings.

Those who could do something constructive for the rail industry will have to come to grips with this dollars and cents aspect of the problem. Railroads are a labor-intensive, capital-intensive industry. We also are an industry of high fixed costs.

The cost of ownership and maintenance of our own rights of way account for about one-fourth of the railroad revenue dollar. User charges paid by ICC-regulated motor carriers of freight amount to about 4½ cents, while waterway carriers pay nothing at all.

It is costing railroads more than two billion dollars per year for maintenance, improvements and taxes on their roadway facilities, not including any allowance for cost of capital or for rental of leased lines.

Railroads have an understandable interest in the level of government expenditures for transport facilities, as well as in the establishment of adequate charges for their use. When the public cost of providing rights of way exceeds the charges collected from commercial users, it creates unequal conditions of competition.

Such uncompensated costs not paid for by the direct beneficiaries also add to the heavy and growing burdens which general taxpayers, including the railroads, must bear.

Since 1947, federal government expenditures in the aggregate for domestic transportation by highway, air and water have increased nearly fifteen fold.

Federal annual spending for the airways system and aircraft development increased from $88 million to over $1.4 billion.

Federal annual spending for airports went from $3 million to $241 million.

Federal cash subsidies to airlines increased from $15 million to $69 million.

Federal highway spending went from $337 million to $5.7 *billion*.

And the federal outlays for waterways—not including multi-purpose projects, TVA or the St. Lawrence Seaway—went from $89 million to $526 million.

Aside from these federal expenditures, state and local governments increased their spending on transport facilities . . . from $3 billion in 1947 to $20.3 billion in 1973 . . . almost a seven fold increase.

When so many tax-supported facilities are available to those with whom we must compete in the transportation market, is it unreasonable for railroads

to ask for help in raising the capital they need for the private sector of the economy? When railroad freight rate increases are delayed and thus fail to keep abreast of rising costs, the result is a narrowing margin of profit. In the last six years, railroads have lost more than a billion dollars in delayed freight rate increases, while regulatory procedures have consumed 1425 days before the increases were allowed. The resultant profit squeeze has done little to encourage private investment in railroads.

Because of a poor rate of return on investment, unequal competitive conditions and time-consuming, out-dated regulatory practices, railroads have had to be content with an extremely restricted and high cost capital market. On some railroads, the lack of necessary capital has forestalled essential modernization programs.

It has been all of thirty-one years since railroads earned the six per cent return on investment which was originally envisioned as fair.

The rate of return on investment and the rate of interest that an enterprise must pay to borrow capital are important considerations in the conduct of any business. In the railroad industry, the two figures have shown some wide swings in the past 25 years. In 1947, class one railroads earned a rate of return of 3.4% on their investment . . . and paid an average of 1.9% to borrow capital for rolling stock. In 1972, they earned a rate of return of just under 3 percent and paid an estimated 7.2% to borrow capital for rolling stock. In 1973, interest rates are even higher.

But if the cost of borrowed capital for rolling stock is high, it is in the area of the fixed plant that railroads encounter their biggest problem. For the most part, capital expenditures for our roadway and structures have to come from earnings. Few railroads today could raise long term mortgage money, either for refunding past debt or for financing new capital expenditures.

Conservative investors have exhibited little enthusiasm for putting long term capital into chronically anemic industries. The rate of return on railroad investment has to be improved and, as an interim measure, government guaranteed loans have to be made available to those roads which need them for essential improvement projects. There is ample precedent for such action. For years, the merchant marine has been aided by government guaranteed loans and, back in the decade of the thirties, the reconstruction finance corporation made loans to railroads, as well as other industries, and ultimately made a profit doing it.

Such loans, however, are only a stopgap, short term solution. For the long pull, we are going to need a better, over-all game plan for managing and regulating rail carriers. Twice now in the past forty years, more than a third of the railway mileage has ended up in bankruptcy. Something is seriously amiss when so essential an industry as railroads cannot earn enough money to serve the public and at the same time afford a fair return to their owners and to those who loan them the necessary capital to stay in business.

If we truly want a first class rail system under the private enterprise system, we are going to have to create a new and better business climate in which rail carriers can improve their profitability as a first step toward improving their service.

Last month, it was interesting to note in the press that the chairman of the civil aeronautics board advocated strong airlines as the best way to insure good service for the public. "Everything We Do in the Next Year or Two," he said, "will be aimed at getting the airline industry up to a 12% rate of return against a current 6½%."

Railroads, even more than airlines, must find ways to buy and apply the latest tools of an advancing technology to improve their service and profitability. That will take money. As far back as the 16th century, the British had a saying "Money Makes the Mare Go."

It still does!

President Bryant: Mr. Grayson, on behalf of both Associations meeting here today, I should like to thank you for appearing before us and inspiring us with your words of wisdom. As you can judge by the enthusiastic response of this assembly, we sincerely appreciate your taking time to address us today. We realize you have a busy schedule and may wish to be excused from this meeting. We would feel honored to have you stay for the rest of the meeting but please feel free to leave whenever you desire. Thank you so much, Mr. Grayson.

Now, Mr. Peak.

Introduction of E. R. Schlaf

President Peak: Gentlemen, I am glad that I have the privilege of introducing the next speaker. He doesn't really need an introduction to this crowd. He is a former President of the Bridge and Building Association and he has been at these meetings many times and most of you know Mr. Schlaf. I first knew Gene Schlaf when he was assistant to the superintendent of water service of our Company, and that was a big job then because our motive power required large and frequent drinks of water. Later on, when water became not so important, Gene moved around a bit and wound up as superintendent of fire prevention. I found that whatever job he held he quickly became an expert in that field and was never sparing in his efforts to be helpful to us on the division.

I don't know how many of you haul these exotic new chemicals, and here the word "exotic" doesn't mean the same things as the signs on some of those joints that some of you may have found last night. But if you do have these exotic chemicals you have probably had some experiences that I have had. At Eden, Mississippi, and twice at Corbin, Louisiana, and recently at Knoxville, Mississippi, and going to a derailment where things are burning merrily and going boom every so often.

If you had these experiences you will recognize the pleasure of seeing this big guy come up, knowing he is somebody who knows what to do and, even more important, what not to do. Whether or not you have had that fun, I urge you to pay close attention to Gene because what he has to say could save your life.

Gentlemen, I give you Gene Schlaf, superintendent of fire prevention, Illinois Central Gulf Railroad. Gene, (Applause)

At Derailments – Don't Become A Problem Or A Corpse

By E. R. Schlaf

Superintendent Fire Prevention, Illinois Central Gulf, Chicago

E. R. Schlaf

Thank you, Roland. Unlike President Bryant, Mr. Peak didn't follow the script that I gave him. It reminds me of the lady in the French Quarter of New Orleans who had a feeling of uneasiness and she went to a doctor. He examined her and found that she had cooties. And she said, "Doctor, somebody's been using my watergate."

Ladies, gentlemen, honored guests, it is indeed a privilege and an honor to appear before this joint session of the B&B and Roadmasters'. As Roland Peak has told you, I have been a member of the B&B for several years. I have watched the two associations help the younger members in many ways. The most effective way has been to hear the various committee reports and then to participate in the floor discussions that follow. The older heads give their views and they are sometimes challenged by the younger ones. It is this free flow of information, ideas and opinions that challenge all of us to seek facts and find a better way of doing our jobs.

As much as I hate to admit it, I am one of the older heads now and I'd like to tell you how to keep from making an ash of yourself at derailments involving hazardous chemical spills.

The expected growth of the chemical industry is 6% to 7% per year, 60% of which is likely to be new exotic products, many of them hazardous. So you may expect to see more placarded cars than ever before.

Historically, most of the incidents you read about or see on television involve placarded tank cars containing highly volatile flammable liquids and liquefied compressed gases. But there are lots of other commodities that are more deadly though not so spectacular. Some chemicals are not very toxic before ignition but the products of combustion are quite toxic. On the other hand, some extremely toxic chemicals, when ignited, yield combustion products that are relatively safe. An example is hydrocyanic acid. This chemical does not give you sufficient warning by its odor alone. Wearing a gas mask doesn't offer sufficient protection because the vapor may be absorbed through the skin in concentrations of 100 ppm or higher. Breathing vapors above 300 ppm for a few minutes is rapidly fatal. Cyanosis leads to "sayonara" as the Japanese would say.

As a member of the Bureau of Explosives Steering Committee, I was privileged to take a guided tour of a chemical plant a few weeks ago. This

plant makes a chemical that is used in providing the permanent press in shirts. One of the ingredients of that chemical is hydrogen sulfide gas. You'll remember from your high school chemistry that H_2S is plain old rotten egg gas. Now you'd think that your nose knows when it comes to hydrogen sulfide. You might be dead wrong because this gas rapidly deadens the sense of smell. A concentration of 800 ppm is rapidly fatal and that's less than 1/10 of 1% concentration in air. We were given the consolation that if one survived a severe exposure to hydrogen sulfide gas, there would be no after effects. I guess the same would apply if one didn't survive.

When a derailment occurs, the first order of business should be to determine what each car contains or last contained. The so-called "empty" tank car isn't really empty. There is almost always a "heel" of liquid in the bottom and, of course, there are the vapors throughout the balance of the tank. If fire impinges on such a tank, there will be little, if any, liquid to absorb the heat. There metal may quickly lose its strength and a bubble may form. When that bubble bursts, plan to be away from the immediate vicinity.

When a full tank of flammable liquid is heated and the relief valve is facing downward, heat impingement may increase the pressure causing the relief valve to operate. This usually results in a chain reaction: the more fuel, the more fire. When an unwetted portion of the tank is heated sufficiently, rupture is likely to occur.

Most flammable liquids produce vapors heavier than air. Propane falls into this category but anhydrous ammonia is much lighter than air. You would expect ammonia vapor to rise but it doesn't if there is any humidity present. Ammonia will instantly combine with it to form a dense fog.

Sound confusing? It is. Obviously, you're going to need instant information on the behavior of chemicals with and without fire and, of equal importance, their possible reaction with each other.

I am going to give you a demonstration I put on three years ago for the B&B. This involves a packaged commodity of potassium permanganate and also plain old glycerine. I'm going to put these together to give you an idea of what can happen when you mix certain chemicals at a derailment. (Fire)

This thing sometimes behaves in an unseemly way. If it does seem to occur, I would like to have everyone remain in their chairs, keep the aisles clear, because I want to get the hell out of here! (Laughter)

I've already added the glycerine and this will give you an idea of what an oxidizer can do.

You can imagine a tank car of this material, glycerine, and a box car of potassium permanganate. The books tell you that an explosion may occur. Not in these quantities. I have been doing this for several years and I haven't had an explosion yet.

Another thing you have to consider is, if you have a car of Class A explosives being threatened by a car of lumber, and next to the car of lumber is some calcium carbide, you get a fire department to apply water to the car of lumber and you get some on the calcium carbide, and I think everyone in the room here knows you are going to get acetylene gas. So, what you have done is compounded your problem. So it is for this reason you must know what is in each car and know what the chemical reactions are.

Fortunately, there are many information sources. Chemtrec is a brainchild of the Manufacturing Chemists Association. You have only to dial toll free (800) 424-9300 to secure information on any hazardous substance. If you're calling from Alaska, Hawaii or the District of Columbia, the number is (202) 483-7616. This service is free and is available 24 hours per day. Chemtrec headquarters has the names and phone numbers of emergency response experts, such as the Chlorine Institute and the Atomic Energy Commission. They will also notify the shipper and, as circumstances warrant, the National Transportation Safety Board

and the Environmental Protection Agency.

The Bureau of Explosives has just published Pamphlets BE1 and BE2, which are contained in a loose leaf binder. The publication, entitled "Emergency Handling of Hazardous Materials in Surface Transportation" is priced a $4 each for railroads and $5 each to others. Many railroads have already ordered thousands of these for free distribution to fire departments and other emergency response groups. They should also be placed in the hands of division personnel having duties to perform at derailment spills.

The National Safety Council has its compact Slide Rule which sells for $1.05 each in lots of 100 or more. The Railway Systems Management Association offers their slide rule, which contains more chemicals and information for $3 each in lots of 100. RSMA's hefty "Handling Guide for Potentially Hazardous Commodities" is actually several books in one. In addition to the usual information, there is a section on paramedical and medical information, as well as one on pollution control.

The National Fire Protection Association's "Fire Protection Guide on Hazardous Materials" sells for $6.75. It features a section on hazardous chemical reactions.

I am going to have it up here for you to examine, if you are interested. The cost is $4.00 for railroads and $5.00 for others. Many railroads have already ordered thousands of them.

Up to now, I have talked about the negative side of the problem, that is where chemicals are spilled. Many organizations are working toward the prevention of hazardous chemical releases by elimination of their causes. The AAR-RPI has spent over a million dollars in developing models of head shields that will protect the tank car head from being punctured by draw bars when the couplers disengage during derailments. Car manufacturers are finding that the shelf type "E" coupler is superior to the "F" type in preventing disengagement.

A study is being made by the Bureau of Explosives of the behavior of rupture discs on tank cars transporting certain hazardous chemicals. Hydraulic surge within the tank during a derailment, aggravated by over-filling, may cause these discs to rupture. If the tank car is in an inverted position, the non-resealable disc may permit the entire contents to escape. At first blush, it would appear that a spring loaded relief valve is the answer. But consider the problems of providing a suitable relief valve that will withstand a variety of chemicals and still function.

The Bureau of Explosives field forces are constantly inspecting not only the loading racks of the shippers of dangerous chemicals but the rolling stock enroute as well. They seek 100% compliance with the regulations published as Mr. Graziano's Tariff 27. The railroads should give them their full cooperation.

The AAR - RPI Research Program on Track-Train Dynamics, in cooperation with the Federal Railroad Administration, provides an approach for solving current problems involving the system of rolling stock, train operating procedures and track response.

When hazardous chemicals are released, the Bureau of Explosives field inspectors and the shipper's representatives are always a welcome sight. The Bureau man is well seasoned in working out the safest procedures with the division superintendent. The older Bureau men take the younger ones along for training purposes. The shipper knows the most about his product and is of inestimable value at the scene regarding pollution control and evacuation distances if, in fact, evacuation is necessary. He knows where neutralizing chemicals are located and how much to use. He can quickly obtain tank cars for transfer purposes. We have always found the chemical shipper to be quick to respond to our call for assistance. Through such organizations as the Chlorine Institute, one shipper may respond to an emergency involving a competitor's shipment. I con-

sider this to be true dedication to safety.

In spite of all possible precautions, any system of moving hazardous materials from one location to another will always incur a certain element of risk. The National Transportation Safety Board has issued their Safety Recommendation R 71-38 to all state fire marshals, which, if heeded, will keep a lot of people out of trouble. Copies are available at the podium at the conclusion of this morning's session. The recommendation cites six major derailments, the chemicals involved, the number of people killed or injured, distances of tank rocketing, number of cars involved, and the time lag between derailment and first explosion. You will see slides and/or movies of four of these incidents this morning, plus a smorgasbord of other chemical spills that have occurred on our railroad and other railroads. The purpose is not to embarrass any railroad or any person but to let you see some of the hazards that you may encounter.

Now, we are going to have some slides.

This happened on Roland Peak's territory. It involves a car of vinyl acetate and this material is inhibited against polymerization in the liquid form but the vapor above it when heated tends to convert from liquid to vapor. The vapor is uninhibited and has a tendency to polymerize into any cracks, valves, crevices or whatever. This means that the material can plug itself up and as it builds up the pressure the polymerization increases, the heat increases and finally you have a rupture.

Stay away from bubbles

You see a dangerous situation evolving here where you have a bubble. I tell the fire department that when a tank begins to bubble, that's the time you've got trouble. Stay away from these bubbling tanks.

Generally you will find that the bubble occurs in the dry area. The wetted area is able to absorb the heat because there is liquid inside.

Here is a car of propane in the same derailment. You can see that it took an awful shot on the end. With such a large hole and such a tremendous release a tremendous fire ball occurred. Nobody photographed it, but it did set the woods on fire and this is an example of the shot in the end of the tank and this is what the AAR-RPI is trying to correct.

Here is a car of concentrated vinegar, called glacial acetic acid. A lot of people don't think vinegar will burn, but when you concentrate it and get it hot enough to get an ignition source it will. It also melted out this aluminum tank.

Here is a car of acrilonitrol, sometimes referred to as vinyl cyanide. Here is a product that is not only flammable, but toxic and water soluble. This means if it gets on the ground you may be permitting it to run into the water-bearing formation and you are going to be polluting some wells.

In this particular case, we have a very small leak here. The chemical shipper immediately came in and pulled a suction on this tank and instead of letting the product leak out of the tank, he was actually pulling air into the tank, which is just dandy because that is one thing you don't want to spill, is cyanide into a community.

It was necessary to eliminate all ignition sources here because we did have flammable vapors present. I was using an explosive meter in this particular case.

It seems as though we had visitors. We had copperheads in there and it seems as though they were either drawn to this material or they were there and didn't want to leave. This one lost his head. I don't particularly find it to my liking to be watching a needle on an explosive meter and also wondering if I'm going to step on some snakes. I have a formula for determining whether a snake is venomous. If it wiggles—it's venomous. (Laughter)

Here is Saral, Mississippi. It's greatest claim to fame is that it has its own zip code. There is a very old post-

master in here. They say old postmasters never die—they just lose their zip. Oh! We have no police patrol here but we do have the canine patrol and, of course, Mr. Sams wants me always to check everything and, as you would expect, that is a male dog!

Can contaminate ground water

Here we have a car of methyl acrolate, another material that is toxic and water soluble, and once it soaks into the ground, runs beyond the oxygen and bacteria, then there is nothing to polymerize it and it is a very nasty material to get in the drinking water. This area had three wells. If this material gets into the wells we're going to have to pipe some water into the community.

Here is the hole in the tank. There was no fire or ignition at this point and it had to do with the flash point of the material. This material has a flash point of about 27 deg. It was a chilly morning in Mississippi of 16 deg. The entire contents of this tank left and went across the tar road. It dissolved it. And it went into an abandoned river bed.

What we had to do was plug this thing up with gunnysacks, Mississippi mud, boards, anything. We don't want a tight seal but we want to keep the vapors in this tank too rich to explode. You talk about explosive range. Your automobile, if you get too rich a mix it won't go and if you get too lean a mix it won't go, and it's the same with this tank car. It has to be within the explosive range before an explosion can occur. If you get it too rich and plug it up with something kind of porous, and then we coated it over with foam and the stench went away and the fellows could keep their meals down and go to work clearing up this derailment.

Maintains fire trouble-car

Here's our tank car that we keep at Memphis, 10,000 gallons of water.

This has about 350 feet of 2½-inch dacron hose, neoprene lined. It has a 100 gpm pump at 100 psi and very good for applying foam over some of these chemical spills to eliminate a fire hazard and also make life a little easier for the men clearing the derailment.

This is a close-up view of the pump. This has a frost-proof suction. We keep this tank out in the open, full of water, in Memphis, where is gets cold enough to freeze hard. By having a dry suction gear draining the pump and the suction line goes up into the tank, goes up inside, and that means you don't have any outside piping exposed to pipes containing water which can freeze and burst.

Here they are testing this material. They tell the chemical shipper. You always find them anxious to come in and take over pollution control and other emergency procedures, neutralizing chemicals and so forth.

Here they are testing this material. They tell me that as time goes by they become more sensitive to this chemical and not less sensitive.

They are taking a sample of this material and they are trying to ignite it here. They figured they could burn it off. It was diluted by too much water.

We threw a dam across here in case it rained to keep this out of navigable streams where it was apt to kill a lot of fish and a lot of flack from EPA, which we didn't want to have happen, not only for the reason of avoiding trouble but also of a civic responsibility.

A truck was brought in by the chemical shipper and they skimmed as much of this material off as they possibly could and sent it back to Texas for chemical decontamination.

Here's the offending tank car. We have now rolled it over and the hole is up here. We want to fill this thing with water. If it is filled with water it simply cannot explode.

We now have this thing completely full and patched up. This pipe ends up right here. You can see that the tank is full. We have water coming out and we have tried to ignite that

material and it was too diluted with water. We drained it off into this 30,000-gallon pit we made. We added gasoline and diesel fuel oil. We had to burn it for several weeks to boil all this material and burn it out of there so it wouldn't get into the underground water supply.

This tank had to be cut up for scrap. The poor soul is going to lay a torch on it. They need to know whether it will be safe.

Purging is quite a delicate operation for some chemicals. We tried 500 pounds of CO_2 and it checked out safe on the explosive meter. The next morning it was dangerous. Five hundred pounds more. Repeat the same thing. We finally got this purged to the point where we could shove this fusee down into the tank so that the man who is going to cut it up isn't going to miss supper. We had to give this fellow ten demerits for smoking in a restricted area.

Propane can be unstenched

Here is a car of propane in a derailment. That is the only patented car in the entire area. This is what it looked like from the other side. And we had to run an explosive meter in there. There was an odor of propane. Don't bank on it. Propane doesn't need to be stenched. LP gas is often used as a propellant in hair spray cans. Its' hard to sell a can of hair spray and have a woman walking down the street smelling like a ruptured gas main. It does come unstenched and don't let it fool you. Always use an explosive meter on propane. We did have an odor here but it was below the ignition mix so we went ahead and cleared up this derailment.

I don't always go to derailments. Sometimes I go fishing. This isn't what I caught. It's what I used for bait. It's what they call a Texas minnow.

Actually, we were at a Holiday Inn having a fire school and a couple of the firemen came in and they were so proud of this catch they asked the firemen in the school if they would like to see a big fish. The room emptied in seconds. We got that shot of it.

Handling fire extinguishers

To you people entrusted with recharging extinguishers, I would like to digress a moment to show you here is a good U. L. listed extinguisher. It's a stored pressure type. And the gauge, as you'll see, is a little lopsided there. This had been on a trip. The fire chief was down in Mississippi trying to augment the income of the fire department and he was filling this one with some compressed air and the bottom came out. There is the dip tube that goes to the bottom of the extinguisher. And he must have been standing right over it because it went right through his chest, came out at his spine, and they had to remove the gauge surgically after death.

Two followed. The NFPA Rules and Regulations for hydrostatic testing of extinguishers, if you don't feel like hydrostating them, then empty and throw them in the junk. They are good scrap right now. Either have them and maintain them or get rid of them.

Here is a car of potassium cyanide in liquid form. This is listed in the books as seven drops are fatal to a 150-pound man. In other words, "A little dab'll do ya."

Here's the leakage we have and it was necessary to get seven drums and pack all this soil out of here. It's just leaking out of this stem. The tank was exceptionally well built but it was leaking there.

Derailment at Glendora

This is Glendora, Mississippi. The Southern Railway got the benefit of this in Reader's Digest. No retraction was ever made but it was, in fact, on the Illinois Central property. And here we have vinyl chloride, several tank cars of vinyl chloride. This occurred about 2:30 in the afternoon. There was a man walking north, in front of the north bound chemical train. He was

aged, he was hard of hearing, and there was no way of alerting him. They big-holed the train, collapsed one empty box car, and this is the result.

There were two shots in the end of the tank and vinyl chloride is a gas that is compressed to a liquid for shipment. It was coming out of there as a liquid, converting to a gas and building up a very large vapor pool because this material is heavier than air. This is why you need to know is it lighter or heavier? You need to consult your books on that. In this particular case this is a delayed fire and this is sometimes a very hazardous situation.

At 8:30 ignition did occur. A lot of people think when you burn vinyl chloride a lot of phosgene gas is given off. This is just not true. The biggest thing that is given off is hydrochloric acid gas, which is tolerable in working exposures for eight hours five parts per million as compared with 100 parts per million of carbon monoxide. So mathematically it is 20 times as toxic as carbon monoxide. That's the thing to look out for. Here the fire is impinging on other tank cars and we recommended staying away until these cars blew up. The next morning at 6:45 the last car to blow up did so. This was taken from a command post nine miles away where the nearest operable 'phone was.

There was an over-reaction here to evacuation because about a year before we had handled a trainload of phosgene gas out of Denver and many people were told how horrible phosgene gas was. And then when they heard that vinyl chloride gives off phosgene gas when it burns, this caused the over-reaction.

This is what we looked at when we came back. One tank car is now missing. It came right through this pecan grove and it landed right here. A lot of people say that center sill box cars do not rocket. This one did. I have sent this picture all over the world because people just don't believe it. It happens.

The other end decided to flatten out. And this is 11/16th steel. It did flatten out and you can see that it didn't go very far in that condition.

Always stay away from rocketing tank cars. You have these bolts and rivets as flying objects that will kill you just as easily as a bullet will.

And you can see how this building was knocked down by the shock wave.

This is what burning vinyl chloride looks like. Some of it soaked into the ground and came back out.

Here is a hog, right down here, that did not die of phosgene or hydrochloric acid gas. It died of burns. Everyone has been evacuated. Down in the Delta country when you evacuate 30,000 people you have really cleared the area.

This is how one of the things burned out. It did not explode but it was a mammoth fire.

Here is the car of tetraethyl lead that was spared because it was out of the way.

This tank is now burning in three places and we're filling this with water while it is burning off. It is giving off this HCO gas, which when you dissolve it in water is quite corrosive. It got into a cotton gin and we had to sprinkle water on the cotton gin and throw a ton of baking soda on it to keep it from working on the gin. It's not the kind of gin you fellows had last night, though.

We're filling this with water, burning it off, and this is a little pilot light here. We don't want this thing to go out and release some more gas unburned.

Accident at Ashton

Here is an example of auto refrigeration when liquefied compressed gas, such as propane or anhydrous ammonia or vinyl chloride, any of these, there is a hole in the far end of this tank and as it boils off it cools this material and the condensation collects on the tank and freezes. You can see you are not going to benefit yourself by putting water on this tank to keep it cool. It's colder than water. It's 32°.

This happened at Ashton, Illinois.

This is a car of vinyl chloride that ruptured and is burning. And there were a lot of goodies in there. There was methanol, and there was some ethylene glycol anti-freeze material, and vinyl chloride. Here is a car of anhydrous ammonia, a fixed tank, up here, but if any of this material had gotten over into the ammonium nitrate in this plant we might have had a hole something like this, 40 feet deep, 125 feet across. This is caused by nitromethane. Without any warning at all, this is the second time nitromethane has cut loose and we said, "Well, that's enough of that." So we don't move it in tank cars, to my knowledge, to this day. But the conductor standing alongside this car is either still running or he's mighty dead.

Here is a car of ethylene oxide. This is one of the tricky chemicals. President Peak was talking about exotic chemicals. Ethylene oxide needs no oxygen to explode. When you heat it to 1054 deg. it will go all by itself. We were fortunate in that this had such a large hole in the tank it burned out.

This did cause a tremendous amount of heat. It spoiled the highways here. It burned down the doctor's home.

This is a rear view of it. The fire chief and I were on the 'phone together. He wanted to know if he could go in and fight the fire in the doctor's home and I said, "Ethylene oxide? No way!" I said, "You stay out of there." He said it was quite a sight to see the thing kind of settle down. It did it very fast.

Here is a mess. A little bit of everything. This is some more exotic chemicals. This train started collecting ties in front of a bridge. Of course, when it got into the bridge and started collecting ties you're going to get Bingo! And this was one of the nastiest ones I have ever been to. I'm not going to dwell too long on it but when you see this much heat then you see it must have been pretty hot.

The end of this tank car came out and came right through this car and I'm shooting right through the car at it. I'm glad I was not hiding behind this car when that thing let go. Stay away from these things. There's no point in it.

Here is a car of tetra ethyl of lead concentrate, also known as MFAK, motor fuel antiknock compound, And I would say that came apart rather violently.

Again, the shipper came in, ran his lead test and found this area was going to have to be cleared up with self-contained breathing apparatus.

This looks like toys. It's not. It's big tank cars. You were there, weren't you, Roland?

President Peak: I'm afraid so.

Mr. Schlaf: We were all afraid. Here is what can happen to a tank car of anhydrous ammonia. This one was struck and instantly released 33,000 gallons of ammonia into the community of Crete, Nebraska. It is this type of thing the AAR-RPI is working on to try to improve tank car performance. It was not the pressure of the product. It was a rather chilly morning and a train derailed and hit this car and caused it to rather hand grenade.

Here is Knoxville, Mississippi. You can't see it here but there is a rather active creek called Wells Creek, about 25 feet across, about one foot deep, and we have a bridge burning with a car of benzine on top of it. The question is, if the bridge collapses, will the tank car of benzine rupture? If so, the benzine is going to hit Wells Creek. This is a national forest. It is so dense that you simply could not do anything short of going up in a helicopter to survey this.

There was also a rumor to chlorine gas being in this area. An empty tank car contains enough chlorine gas to give you problems and when you heat chlorine gas above 500 deg. it starts to dissolve the container. We didn't want that to happen. In this particular case, one look and you can see that this tank car is from here to here, and half of it is on the steel portion of the bridge and the other half is on the south approach to the bridge. The south approach, which was of wooden con-

struction, burned out and this tank cannot rotate. The relief valve is functioning just as it is supposed to. And everything is all under control. Until we could get that helicopter up there to see what it looked like, it was really dangerous to move anybody in.

This is a close-up view. Here is the bridge that burned out. The relief valve is working O. K. The thing cannot rotate because the steel bridge is going to keep the relief valve in an upright position and that's the way the engineers designed it.

I'm going to try to get a patent on this material. This is hydrogen peroxide. It's excellent for cleaning ballast. You just don't have to do anything but put it on there and it will burn every organic thing out of that ballast. The only trouble is, it burns the ties out, too. Here's a rim of fire, around here, and that's the answer to this. This is the same material the ladies put on their hair. That's a 3% solution and by the time they put it on they cut it some more. But this is the concentrated stuff. And all you have to do is put it on there and it's going to take off.

Batteries cause explosion

This once upon a time was a plug type box car that had plug-type doors, I should say, and it contained lead acid batteries that had been fully charged. This meant that in each battery there was an accumulation of oxygen and hydrogen. A spark got in there and this thing instantly converted to a flat car, a sway back. It looks as though its mother was framed by a dachshund. It blew the top off, blew the sides out, blew the end out, and this all very quickly.

Even the under side, you can see how it sagged it. I mean, hydrogen, and oxygen, and a spark, if you don't vent it, it will find its own.

Since then there has been a recommendation to move batteries in less airtight cars.

Roland, I'm picking on you, but this happened when four kids decided it might be fun to derail a chemical train. They took an axe and chopped off the switch lock and threw the switch and they did a pretty good job. The reward—no school the next day. It released chlorine gas in the community and everyone really did a beautiful job of cooperating, the community did, the state troopers did. Here is a car of vinyl acetate burning.

Here is a release of chlorine gas. This will give you an idea of what that looks like.

And here we go to Crescent City. Now some of these slides are, I think, in backwards. We go to Crescent City on the T. P. & W. Railroad. It was well publicized. Maybe a lot of you people have seen it. I'll go through it quickly. We have nine cars of propane and a car of sand ahead of it. The car of sand developed a hot box and burned off a journal and these propane cars climbed up over the sand. Some of the propane soaked into the sand. Some of it burned off instantly and set fire to the downtown community of Crescent City, the downtown business district of Crescent City.

The fire department came in and they are trying to put cooling streams of water on it. But they have a whole mess of propane cars here and some of the propane has soaked into the sand and you have just a regular bonfire going. The first in fire department was soon knocked out of action by an explosion. A man was sent to the hospital. Then several community fire departments came in with dissimilar radio frequencies and a shortage of water because the first explosion broke the water mains in two places. And, the firemen were threatened by overhead wire lines, so the power was shut off, and that meant the water supply here was rapidly diminishing from the broken water mains. They used the cooling streams. Here you see a monitor nozzle trying to cool these tanks to keep them from exploding.

Whenever you see this much fire you want to arrange to be away from

there. Here is a very clear shot. You have one, two, three, four cars right there. You can't do much. It's a loser. So the best thing to do is to find some other place to be.

Don't stay in the area

When you see this much fire, you are going to expect this. Don't be in this area.

And you see a series.

Every one of these cars was eventually involved. Now we have more fire from heat. Many firemen ran out from under their helmets and had their heads burned. They hid behind buildings but the fire ball got up high enough and it burned their heads, anyway.

These are gangbusters.

This will give you an idea of the 110-foot tank and the height of the fire ball was so great you don't want to even be in a helicopter over this one.

This tank rocketed 1750 feet.

And now we'll see the movies of Crescent City as taken from the ground.

This is taken by Vern Belt. You will have to pardon his photography at certain points. He just put the camera over his shoulder, turned it on, and ran like hell. He shouldn't have even been in the area. I later saw him at Ashton. He hadn't burned anything. He was hospitalized taking shots but he was right back in business at Ashton. That's their business.

Whenever you see this much fire impinging on uninsulated tank cars, and you can tell if they are insulated because if they are insulated they will be black and if they are a light colored reflective paint they are generally uninsulated, you get away from there.

There is a ruptured water main. A piece of steel went right down in, hit the main and broke it and then bounced right back to the surface.

When you have this much fire on propane, get out of there. You're not going to save the product. You're not going to save the tank.

There's a guy running—no guts! (Laughter)

This fellow decided to go down and take a look. He doesn't like it and he decided to get behind this stout building.

That's a lot of heat units being given off. Something is going to get hot.

There he goes again—no guts! Coward!

Watch this man on the side here. He decided to get a ringside seat and he's going to get his mind changed right now. If you look up here you will see what the inside of a fire ball looks like.

The fire chief ran underneath this fire truck and the young driver tried to drive off with him under there.

Here's a man worrying about a $75 length of hose, and $2.1 million damage around here. Of course, that's his hose! It makes a difference.

Vinyl chloride derailment

Now can we turn it off for a moment, please. Leave the lights off. What you are about to see is a vinyl chloride derailment involving two cars of vinyl, one that had a 1,000 gallon per minute leak, a tremendous amount of fuel released, and there was a second car that had a slower leak in it. One car burned out. The other car was slower and was squirting vinyl out against the gondola car and the heat was bounding back so that the tank was impinged with heat from its own self. As the liquid level was high a man you will see on top of an aerial ladder was trying to cool this tank. The tank got lower and lower on the liquid level and pretty soon he saw he was not able to control it and a bubble appeared and blew the tank.

Now there was one man taking photographs down in the area and he was killed. You don't see him. The man on the ladder was blown from the ladder and he is still alive and kicking today.

The rest of the film is self-explanatory.

By now you can see that it's easier to

stay out of trouble than it is to *get* out of trouble. In response to a request by the National Transportation Safety Board, the AAR recommended, as safe practices for the transportation of flammable compressed gas, the following:

1. Accelerate installation of hot box detectors on routes where there are heavy movements of flammable compressed gas and experience and studies show such devices are needed.
2. Expedite installation of dragging equipment detectors.
3. Increase rail inspection with flaw detection equipment.
4. Inspect axles by ultrasonic means with reflectorscope.
5. Expand educational programs for railroad officers and employees in various aspects of handling flammable compressed gas under emergency conditions. Also, increase cooperative programs with local fire departments and other civic groups, to assure proper and coordinated effort during emergencies.
6. Periodic inspection of track, switches and frogs by competent personnel.
7. Strict enforcement of:
   —inspection by trainmen of passing trains:
   —Walking inspection of trains by trainmen when delayed for "meets" or "passes", with critical inspection of running gear and any unusual condition on any car in the train; and
   —inspection of passing trains by other railroad personnel who are near the track.
8. Insistence on high quality inspection and maintenance of rolling equipment by qualified personnel at inspection and maintenance points.
9. Greater participation in the AAR "Early Warning System".
10. Improve train handling by additional education of employees in the dynamics of train operation and implement research findings as rapidly as they are developed.

You as officers in the Maintenance of Way Department, should heed those recommendations that apply to you. Your preventive actions and your recommendations to management may well keep you from becoming a problem, or a corpse, at a derailment.

President Peak: Thank you, Gene. Some of those pictures brought back memories I would just as soon not have had brought back. I know you will take it in the spirit intended when I say I hope I never see you again unless you come through New Orleans on vacation. But the railroad business being like it is, I think we can probably expect to be together again at a fire that isn't a wiener roast.

Darrell, I will return the meeting to you.

President Bryant: I must say that was something else again, wasn't it ?

Introduction of Dr. Carl Winters

A few years ago in a little Ozark town where I now live a grumpy old judge reprimanded a young lawyer who was pleading a case before him. "Young man," said the judge, " I have listened long and patiently to your pleadings but I'm no wiser than I was when you started." To which the young lawyer replied, "I never expected your honor to be any wiser but I certainly thought you might be a little better informed."

Our next speaker may not make us any wiser but you can be sure after he has finished we will all be better informed.

To many of you he will need no introduction since he has twice before honored us with his inspiring speeches. I have looked forward to hearing him again, as I am sure you have, also.

He is a man who won first prize for speaking at the age of eleven. He was born on a farm in Indiana, so he was well acquainted with the topic of his prize winning speech, "How To Raise Duroc Hogs."

He was a Baptist Minister for over

thirty years. having headed the large First Baptist Church in Oak Park, Illinois.

While he was a Minister in Michigan he was appointed Chairman of the Crime Commission in the State of Michigan, and later in Chicago he served as Chairman of the Skid Row Commission. It was in this latter position that he became eminently acquainted with railroaders. Is that right? Like Mr. Grayson said, I'm saying what he tells me to say.

He has traveled around the earth many times on assignments dealing with crime prevention and crime rehabilitation and has earned a reputation which has placed him in Who's Who In America and Who's Who In The Midwest in many years.

Since 1959 he has devoted his full time to writing, lecturing and traveling assignments.

He is a guest speaker for the Electro-Motive Division of General Motors Corporation and it is through the courtesy of G. M. that he now appears before us.

It is with considerable pleasure that I now present to you the distinguished Dr. Carl S. Winters. Dr. Winters.

Opportunity Unlimited–The Decade Ahead

By Carl S. Winters

Thank you, Mr. President, for that lovely introduction, and, Mr. President on this side also.

Our friend Schlaf said, "Boy! He didn't want to follow me because I was a hard act to follow."

This amazing photographic story of the inferno of action reminds me of one day when I was in Tokyo and I was in one of those doodle-bug taxis. They don't drive them—they just aim them. And, we were headed down the Ginza and the driver was laying on his horn and people were jumping out of the way like a lot of scared chickens in a farm lot. I was praying that I would live through this experience and promising the Man upstairs that, if I ever got out of that taxi, I would never get in another one. And, I saw a large overpass way down the Ginza ahead of us and as we approached it I noticed it had an abutment and I hoped we would miss it, and we did, but as we whizzed through at a very high rate of speed, there was a sign in English, because we had at that time 300,000 American boys based in and out of Tokyo and Yokohoma, and this sign in English said, "Safety Is No Accident. Safety Is On Purpose." And by George, you have had the most effective picture of this tragedy of the failure of safety and making the point of the preventive things that we can do.

Inoperable plane is loaded

You know, I have noticed the management of so many things that frighten me. I was out in Salt Lake City the other day and I had a heavy program and I went out to get on my plane early in the morning. We had gotten on the plane at 8:00 o'clock and at 8:20, at the time the plane was to take off, the little stewardess said, "Ladies and gentlemen, this plane isn't going to fly today. We're going to have another plane."

And I said, "Well, what in Heaven's name is the matter?"

She said, "Well, last night, when they came into Salt Lake City, three of its four generators were not working and we can't fly with just one generator working."

"Well," I said, "honey, why did you load the plane this morning? Why didn't somebody last night say it coudn't fly?"

There were 160 people on that plane headed for Washington, D. C., and Chicago and points east, and they had let a plane sit there all night without even reporting that it couldn't possibly fly. Now think what the company lost on a thing like that. That's what you call educated mismanagement. If they had done just a little preventive planning, or something like that.

I didn't intend to get off that way, but this was fantastic. It is something that in these complicated days we had better remember.

I was reading about our pioneer days the other day and this old woodsman back there 100 and some years ago came in from the woods and he said, "Ma, we got to move. Some feller has moved in here 80 miles down the trail. We've got to move. It's gettin' crowded.

Well, today it is crowded and no matter where we shipwreck, we have a crowd.

Gentlemen, I am delighted to be back— and a little bit amazed. I was looking at my record. It was two years and four days ago I was with you. And you know, you are the most amazing gang I have ever seen. I wonder if anybody pays any attention to public speakers, especially a fellow who doesn't know anything about your business. I'm not technically fit to stand in front of you. But since I have come here today, six different people have told me four of the stories I used two years and four days ago. And

for you lovely ladies, may I say the one they told me the most often was the wisecrack I made that when a man goes to a convention like this and takes his wife along it's just like going hunting with the game warden.

But we don't dare tell stories like that any more because women are so important and they are doing some tremendous things. Did you hear about the lady who stopped a robbery here the other day at the bank? The fellow came in with his gun in the old paper sack and demanded something of this woman. He said, "Give me your money!" And she said, "We don't give away money here." He made a couple of other cracks at her and she didn't give an inch and finally he took off and ran like a scared rabbit. And when the president found out she had thwarted this intended robber, he said, "Well, what did you do to that man to scare him so badly and get him out of here without taking any money?"

She said, "When he said, 'Give me that money or I'll put a bullet through you,'" she said, "I told him, fix your tie, stupid—you're on candid camera." (Laughter)

I keep a record of what I say, so I told you a lot of stories the last time and I left out these I do want to tell you as I begin.

I get a lovely introduction like this and it always reminds me of a thing that happened when I was head of the Skid Row Commission here in Chicago. We had a fire on our worst Skid Row,. west Madison Street, and a couple of old men were burned to death. Mayor Kennelly, who was our Great White Father at the time, called me about it and one of my little daughters answered the 'phone. His Honor said, "Is Dr. Winters there"? She knew what a medical doctor was and she knew what a dental doctor was, but she wasn't sure about my kind of doctor. So she hesitated a little bit and then she said, "Well, yes, Doctor Winters is here—but he's not the kind of a doctor who will do anybody any good."

Mayor Kennelly was a good Catholic and he always chuckled every time he saw me after that. He said that was the best description he ever heard of a Baptist clergyman. (Laughter)

I told him one day I thought he was pushing that point a little too far, so the next time he introduced me he countered by telling this story. He said I reminded him of an old woman who had been everywhere, had the money to go anywhere, but didn't know where to go. She was pestering the daylights out of the railroad agent to see where she should go. She was holding up 17 typical Americans in the line, all of whom were in a hurry and some of whom wanted to tell her where to go. He saw the situation, decided he would break the bottleneck and get into production by making a suggestion. He said, "Mrs. Jones, why don't you go to Ireland? You've never been to Ireland and that's a lovely country."

She said, "I don't want to go to Ireland. It's cold, and it's damp, and it's full of Catholics."

The fellow behind the counter said, "Why don't you go to hell? That's hot and dry and full of Protestants." (Laughter)

And you know, I didn't think that was funny! (Laughter)

Anyhow, it is fun being here with you. You have had an hour and a half of magnificent presentation that is right down your business and professional alley. I'm not a railroader. There is something romantic about part of it that I would love. I had plans made with two presidents of railroads to go on long trips in the president's car and both of them died before I got around to it.

I can't talk to you about this big, essential business of yours. Technically I can talk to you about this land of ours, with its problems and its powers, in which you and I operate and in which we need an attitude which I call "Opportunity Unlimited in the Decade Ahead."

I was in Washington not long ago and one of my Senator friends who was entertaining me said, "You know,

Carl, Washington, D. C., is the only insane asylum in the world that is run by it's own inmates. Those boys are up tight about some of the things. He said, "You know, it's the only town I have ever lived in where they had a cocktail party to raise money for Alcoholics Anonymous." (Laughter)

Coolidge anecdotes

We were talking about the kind of men who become President of the United States. And I got held up with old Cal Coolidge. He was quite a character. He didn't say too much—but what he did say, people sort of remembered.

For instance, he went to church alone one Sunday morning and when he came home, his lovely wife, Grace, said, "Mr. President, what did the minister preach about?"

Cal said, "Sin."

She said, What did he say about it, Mr. President?"

Cal said, "He was agin, it."

An effusive woman moved up to him at a banquet one night and, she said, "I have a bet with my husband that I can get more than four words out of you tonight." He said, "You lose."

But a thing I thought was so beautiful, he walked into a Cabinet meeting one morning and he said, "Gentlemen, the first matter of business this morning is this." He said, "I have a political friend out in Chicago whom I want to put as the head of a certain department of our government." And one of the Cabinet men put up his hands in holy horror and he said, "Mr. President, that man is an unmitigated s.o.b."

Cal said, "Yes, I know, but," he said, "there's getting to be so many of them around here I think they ought to have representation."

Well, things haven't changed much in Washington since Cal Coolidge, and yet, gentlemen, this is what I want to say today. With the tremendous problems that we face, the incredible difficulties of our times, let's don't lose sight of this fact, that America today is more than when Lincoln said it, "The last best hope of earth." That's because of our economic system, no matter what its problems, because of our economic system of free, competitive, creative, capitalistic enterprise, we have made the finest products for the widest distribution, paying the highest wages, and getting the most fantastic standard of living history has ever known.

The flowering of our freedoms have given us the greatest abilities, attitudes, attributes, and dreams ever recorded in history. And today, in spite of our problems that we have, you and I at this very moment here in the Conrad Hilton Hotel are still the best fed, best clothed, best housed, and best educated people in the world.

So, when we look out at the world today, if we are wise we will look at its problems, but if we are wise as we ought to be, we will also look at its powers and we'll get up every morning and say, "Thank you God again for this opportunity of living in a time like this."

One of my Catholic priest friends beautifully defined opportunity unlimited for me. He said, "Opportunity unlimited brilliant disguised as insoluble problems."

Certain people solve problems

So I look at you men today in an essential industry with colossal problems and say to you, "The one part of your equipment that I know something about is the human part. And that you will solve these problems but it will depend upon what kind of people you are."

I have always loved the true story of the building of the Panama Canal. Teddy Roosevelt was President—and he waited until Congress went home so they wouldn't interfere with him, and then he called a retired army Colonel, Colonel Goethals, down to his office and he said, "I want you to go down to the Central American Zone and dig a ditch across that Isthmus." He said,

"I want you to tunnel through nine mountains, and make nine locks that will lift the greatest ships. I want you to handle hundreds of thousands of men, spend millions of dollars of money. I want you to control the tides of the sea and make a water route that will cut 8,000 miles off the distance from New York to Los Angeles. And I want you to make it snappy."

Now this was a typical Teddy order. The Colonel started out to do it. The newspaper men, knowing that several companies had tried and failed, that thousands of men had died, that millions of dollars had been lost and that engineering-wise the project of building the Panama Canal was considered absolutely impossible, and the newspaper men started to follow the old Colonel, and one of them said, "What are you going to do when you get down there, Colonel?"

He said, "I'm going to build a canal."

"Well," they said, "supposing you have an avalanche and a mountain falls in. What will you do?"

He said, "I'll build the canal."

He said, "Colonel, supposing you have a strike and the men won't work, what will you do?"

He said, "I will build the Canal."

"Well, now," he said, "Colonel, suppose you have an epidemic and men die, as they have in the past, what will you do?"

He said, "Gentlemen, I will build the Canal." He said, "I think you men ought to understand at the outset that my interest in the Panama is not primarily engineering. My interest in the Panama is in the people. If I can handle the people—the Canal will build itself.' '

Well, now, as you know by history he went down there and he organized 27 different nationalities, colors, creeds and groups into working teams. He taught them silly little morale building songs, like, "Got any river they say isn't crossable? Got any mountain that isn't crossable? Got any mountain that in the wholly impossible in doing what no man can do."

The day came when the first boat went through the finished Canal. The old Colonel stood and watched things. The newspaper men watched the Colonel. And a Chicago newspaper man that day, realizing that this miracle of impossibility had become possible, didn't send a typical byline back to his paper. He sent instead a bit of joggled verse that contained an eternal truth. It said:

"A man went down to Panama where many a man had died:

To slit the sliding mountains and stem the eternal tide.

A man stood up in Panama—

And the mountains stood aside."

"If I can handle the people—the Canal will build itself."

Here was an impossibility. And here was a man matching it who didn't know it was an impossibility.

That's the way we got our railroads in America. That's the way we will maintain them as an essential part of our growing transportation problem and power.

The thing then that I have to say to you today is simply this. Without dodging the fact we live in some of the most shockingly difficult situations man can think of, I was interested when our first speaker was talking about the money problem. The other day I addressed a thousand of the airport and air transportation executives down in Kansas City. I was amazed that every one of those concerns does something that I as an Indiana farm boy was told you couldn't and shouldn't do. They operate on a $200 million deficit. It was staggering to me. One company bought 13 747's at $23 million apiece. They fly them up and down and across our busy airways half empty half the time. They are having to make adjustments.

I don't know how to tell you about money. I'm quite stupid about money. Baptist preachers don't see much of it. I do know it's a good tool though and you do have to have some of it. So I'm just going to talk about the men and not the money.

I remember the epitaph on a tombstone up in New England. He said, "He fought a good fight—but his razor was dull." The tool was no good and he was as dead as a dodo. I think you'll have to handle the money situation.

What I'm talking about is people—people who do things.

Just small machines

Down in Peoria, Illinois, was a magnificent old chap who made this statement one day. He said, "There are no big jobs. There are only small machines." And LeTourneau went out and built an earth mover—an earth mover that would waddle down the street because he put engines on each of its feet. And he made an earth mover that could lift a six-story building at one time, a half block wide, 6-story building, and just take it down the street and set it down in a new location.

And one day out here on Michigan Avenue, where we are now, just a block south of here, one day we had a storm and a 20-ton sign on the top of a 20-story building down there got blown over and was hanging precariously over the edge of the sidewalk down 18 stories below. They simply sent word down to the south side of Chicago for one of those machines. And it came up through the narrow streets on the south side of Chicago, came up here, and sent a derrick up to pick up that 20-ton sign and set it back on top of the roof and held it until they put it in place.

"There are no big jobs—there are just small machines." But do you know what I got to thinking about that? Before there was that big machine there was a big man with a big idea. And you know, as I said to you two years ago, the lesson I learned at the Space Territory in Houston, Texas, where I was looking at an automation machine that makes 100,000 accurate computations per minute, and the operator of that machnie said, "Don't get so excited Doc—the thing is only an obedient idiot. He just does what I tell it—and if I tell it wrong it will be wrong forever unless I correct it." And then he said, "What I think is the most important thing, remember one machine may do the work of 100 ordinary men, but no machine can do the work of one extraordinary man."

Now I have faith and hope in the next decade because of this simple fact. We American people are problem-solving, miracle-performing people. We get some piled up messes of big jobs but there is always a big man somewhere who can do that job. And in the last ten minutes of my message to you may I suggest some of the attributes.

A big man is knowlegeable

I think, first of all, that big man has to be a smart man. I think a big man is a man of usable knowledge.

I used to love the $64,000 question. I loved especially the way it went on and off the air. It said, "This is a show on which knowledge is king and the prizes are king size."

Well, gentlemen, you are in an industry in which knowledge is king and the prizes are king size. Whether it be the increasing power you have to perform a service which we need or the increasing technical knowledge that when you overturn one of these chemical tanks you know what to do to keep from being "sent upstairs" quicker than you had planned.

Knowledge is king. Do you remember when Scott Carpenter was in orbit going around this planet at an incredible speed? He made an error of ten seconds in a bit of mental information and the synchronizing machine down in the Space Territory in Houston, Texas, and that ten-second error put him 250 miles off course at splash down.

I got thinking about that and I said, "By gosh, in this age of engineering ingenuity and technological know-how it's dangerous to be dumb." That's why

I say to kids in graduating classes all over this country, "Don't be any stupider than you have to." God almighty never rounded any important curve in history with an ignoramous at the head of the procession. To have a kindergarten mind in an adult body in the atomic age is a supreme crime. This is an age that demands knowledge in so many different fields.

I sometimes look at the management men and women in big business and I sometimes think they have to have more knowledge than one man can have, really. And God knows that men like the President and Vice President and politicians everywhere have to be smarter than they are.

But, you see, knowledge is not the only thing. It is an important thing but it is not the only thing.

Episode of plane in storm

I have to leave here and go to New York to lecture in the middle of the afternoon, which reminds me of the time I had just come back from a trip all the way around the world, and we hadn't had any troubde at all with our planes except that out in Cairo we lost an engine on one of them. We had a four-motored plane. We put down one and carried three and went ahead. But when I got back to Chicago I had to go to Grand Rapids to deliver an address before the Chamber of Commerce. It was a wet, foggy, murky day. I didn't think we would take off--but we did. We roared down a wet runway, took off into a soupy sky, and when I got up there I looked out to see how everything was because I was in it and more or less interested and I couldn't see a thing. The fog closed right into the windows. But I could hear the engines and I trusted the pilot, so I got my speech out and began to work on it.

We had been flying about twenty minutes and, wham, we hit something! We shot up in the air, we turned halfway over, we dropped 2,000 feet, and then for the next 20 minutes that airplane was like a hotrod going over a series of railroad tracks at 100 miles an hour without any springs. We just bumped and turned and bounced. It was the first time in my life I ever heard strong men scream in terror. It was the first time in my life I ever watched a group of people pray in complete fear because they were afraid they were going to make a more sudden exit from this world than they had planned.

I just watched it because I was all prayed up. (Laughter) I don't mean to be irreverent, gentlemen. I just mean in a world like this it's a good idea to stay prayed up. You don't know when you're going to need it.

Well, after a while we came to a bumpy landing on a dark runway and taxied into a blind terminal that turned out to be Grand Rapids. The committee was there, they took me over to the Pantlind and I delivered my address. They rushed me back to take the night plane home. And here stood the pilot and the little hostess, who had turned back to her normal color. And the pilot said, "You don't need to be in a hurry, Doc. We're not going home tonight."

I said, "What do you mean? What's the trouble?"

He said, "The plane is out of business." He said, "Out in the middle of the lake we hit a storm center. We shot up in the air 2,000 feet, it turned us half-way over, dropped us 2,000 feet, broke most of the rivets out of the left wing, damaged several of the instruments, and we were lost."

I said, "Well for Heaven's sake, how did we get to Grand Rapids?"

He said, "Back in Chicago on the radar board was a little dot and," he said, "that was us, and the engineers picked us up by remote control and guided us around the rest of that storm and put us down on a blind runway with a smashed-up plane." And I'm alive, as are 33 of my fellow Americans, because the engineers know so much that I just don't even understand it.

This is a world in which knowledge is king. And the prizes are king size.

But remember another thing, gentlemen. Knowledge is power but power is only good when he is good who has it.

Now I was startled when I heard these kids had decided it would be a lot of fun to derail a train. I mean, here, these kids are smart so they derail a train. That's the misuse, that's the prositution. And you see why it costs the railroad and the community.

I had 31 murderers paroled to me—and at least that many church officials who should be paroled to me—and the most famous of these parolees, Nathan Leopold, had an I. Q. of 210, gentlemen. Genius begins at 140. And yet masterminded by a buddy in one of those days in the roaring '20's, they were guilty at that time of the worst murder of our century up to then. It has become habit now. It's not how much you know, it's how you use it.

Prison inmate builds a desk

I used to preach every Sunday over the radio in Jackson, Michigan. And on Mondays I would go out to the Southern Michigan penitentiary, where I had a lot of friends—among the guards. And I was standing there one day and I saw a beautiful piece of cabinet work. I said to the teacher, "Where did you get that?"

He said, "Bill made it." And I looked at Bill and recognized him as a life termer in the Southern Michigan Penitentiary. I said, "Bill, that's a beautiful piece of work. Some day I would like you to do something for me."

He looked at me and grinned rather sheepishly and said, "You know, Winters, I'm not going any place. If I can do anything for you, let me know."

I said, "Well, you can do something for me. I want a desk built that will go all the way around me. I want to be able to sit in my swivel chair and have space to muss up in any direction I turn. I want to be able to put 100 extra books on the top level, 200 extra magazines on the bottom level, two extra file cabinets to my back." I said, "I want sort of a lazy man's desk."

"Do you have a picture?" he said.

I said, "No, I haven't any picture but I'll sketch it for you." So I sketched it on an envelope and gave it to him and he said, "Sure, I can do that for you."

They took Bill out of the cell where he had lived for 17 years. They gave him walnut wood from Chicago. They locked him up in the basement shop of the penitentiary. And three months later the prison truck rolled up in front of my home and unloaded a desk which made newspaper headlines at that time across the country. It was twice as beautiful as I had hoped, and three times as efficient as I had dreamed. It's still in the center of my library out here in Oak Park.

But the important thing about this true story is not the desk, lovely though it is. The important thing about this true story is the man—the man who built the desk. For the man who built that desk for me is in the penitentiary for life serving two life terms and cannot be paroled for the brutal murder of his wife.

Now I never did ask Bill why he did it. She probably deserved it! (Laughter) You know how wives are. I'm sorry girls. I didn't mean that.

But here's what I learned from that situation. Here is a man who was brilliant of brain and brutal of heart. He is a man who is technically expert and emotionally unbalanced. He is a man who had the tool know-how and no character control.

Now, gentlemen, there has never been a moment in history when we needed brilliant brains, technical expertness and tool know-how like today. But the smart men have given us the tools by which we can unfailingly accomplish our own extermination unless good men use the tools.

It's what one of our educators said the other day in a rather frantic situation, "What's the use to teach a kid seven foreign languages if he can't tell the truth in any of them?" And we are at one of those moments in history

when we need to take a new look at the simple fact that the greatness of America was built upon your religion and mine, Catholic, Protestant, and Jew, with an ethical insight that came down from above.

I do not care what church you belong to but I do want to say to you that all you need to do is look around at our world today and realize that if we make the next giant leap towards hope, we will have to do it on the foundations on which this nation was built. A faith in God and love of our fellow man.

Do things together

Now, I have taken my time but I want to say one thing more. We've got to do it together, fellows, we've got to do it together. Here you are today, two groups together. You have big enough job in your industry to take two groups or four groups or one hundred together.

Said Ralph Waldo Emerson, "together" is the most beautiful word in the English language outside the word "mother."

You know, it's an amazing thing how many people don't get together. We had a mad dog scare, you remember, about ten years ago on the south side of Chicago. A fellow had been bitten by a dog. The dog got away. They caught the man and they took him to the hospital to give him some tests to see if the dog was rabid, and he was. The doctor came in, using his best bedside manner, and said, "Sorry, Bill, but this dog was rabid and you are in for some trouble. But," he said, "If you will take these pills I'm going to give you, do what the nurses tell you, give us a couple of weeks of time," he said, "I think we'll have you out of here as good as new."

Bill looked at him very seriously for a little while, and he said, "Doc, give me a piece of paper." The doctor gave him a piece of paper and he started writing real rapidly and quite intently. The doctor looked at him in amazement. He said, "Wait a minute, Bill, I think you misunderstood me." He said, "It's true you have been bitten by a mad dog. Its' true that's serious business. But it is equally true that medical science is a miracle worker and you aren't going to die. You don't have to make out your will."

He said, "Will—hell! I'm just making out a list of people I'm going to bite." (Laughter)

Do you know anybody in your industry who goes around with a list made out?

It was one of your Presidents two years ago who handed me this little verse.

The fellow said:
"I'm not allowed to run the train
The whistle I cannot blow
"I'm not allowed to say how far
The railroad cars can go
I'm not allowed to blow off steam
Or even clang the bell.
But let this damned train jump the track
And see who catches hell!"
(Laughter)

Now what I'm trying to say is this, and I'll close with this story.

You remember I said two years ago that when a Baptist preacher says "Finally," he doesn't mean immediately. But I have one hour to get on a plane to New York.

Life requires mutual help

We had a character in our community who said something I want to leave with you. He was one of those fellows who had his religion in his wife's name. (Laughter) And when he died they didn't know where to send him. They decided since he had no religion of his own they would let him go down stairs and try it first.

So he knocked on the door and the old devil welcomed him in. A beautiful room like this, in the middle of which a great, big table filled with some of the most luscious food he had ever seen in his life. He thought, "Can this be hell?" He looked around

quickly at the people and they looked like walking cadavers. They seemed to be starving to death and he wondered what was the secret. He looked for a little while and he found the secret. Every man in hell had splints on his arms. They were sticking straight out from him. And he was starving to death in the midst of this luscious food because he couldn't feed himself.

But they didn't keep him there. They let him go upstairs. He knocked on the door and St. Peter welcomed him in. The same kind of room, same kind of table, same kind of food. He looked quickly at the people and they had the same kind of splints. And he looked at their faces and he saw that they were happy, well fed, and contented. He watched for a little while and he found the secret. The secret was that in Heaven every man fed his brother. And that was the Heaven of it.

Did you ever stop to think, my friends, in the practical sense that perhaps the difference between Heaven and hell on earth is the difference between going it together and going it alone? The difference between cooperation and opposition? The difference between building and destroying?

The next decade will see you gentlemen putting those differences together to help do what all of us want to do and which was so beautifully said the other day by Col. John Glenn when he and I were lecturing in New York. He ended his beautiful address saying this—"America—love her—and make her better."

Thank you very much. (Prolonged applause)

President Bryant: Dr. Winters, it has been our pleasure to have you speak to us today. Your timely remarks shall be an inspiration to each person here today. I'm sure that I speak for each one here when I say thank you very much.

This concludes the second and final Joint Session of the 1973 Convention.

As of just a little while ago we had a registration of Roadmasters—members, 369 — guests, 101. B&B—members, 156, — guests, 39. Or a total of members and guests of 705. We had 122 ladies. Ladies and gentlemen, that's quite a feat today.

Roland, do you have anything to say?

At 1:30 P.M. the separate sessions will reconvene with the Roadmasters' Association meeting in this room and the Bridge & Building Association meeting in the Beverly Room, where we met yesterday.

Dont' forget Mr. Schlaf's literature that he has here which perhaps might save a life.

If there is nothing else, this session is now adjourned.

. . . Recessed at 11:35 A. M. . . .

AFTERNOON SESSION

September 18, 1973
(Beverly Room)

President Bryant: The meeting will please come to order. The second meeting of our 78th Annual Convention is now in session.

The first feature of our afternoon session was to have been a panel discussion of "Problems and Procedures When Installing One-Spot Car-Repair Facilities". Mr. W. C. Sturm has endeavored to organize a panel for this discussion but was unable to do so. However, Mr. D. A. Bessey, assistant architect for the Milwaukee Road has come to the rescue with a paper he has prepared on this subject.

A year ago, the Buildings Committee of the AREA published as manual information the subject "Design Criteria for Spot Car-Repair Facilities, the chairman of Committee 6 during the time this report was being prepared was Mr. D. A. Bessey.

Mr. Bessey is a 1949 graduate of the University of Illinois with a Bachelor of Science in Architectural Engineering and he is a registered architect in the State of Illinois. The AREA report covered design requirements. Today, Mr. Bessey will present some of the problems occurring in the construction and maintenance of spot car facilities. Mr. Bessey.

Spot Car–Repair Shops

By D. A. Bessey

Assistant Architect, Milwaukee Road, Chicago

The "Spot Car-Repair Shop" innovation has been around for some time. There are approximately 50 such installations on the railroads throughout the U. S. and Canada; that is 50 facilities complete with stationary jacks, automatic car-progression systems and the numerous other devices and implements which are normally considered to be a part of an automatic Spot Car Shop. In addition to this, there are approximately 50 other car-repair installations throughout the U.S. and Canada employing the "One Spot" approach; however they are void of the car-puller type of car-progression system and other automatic devices.

I quote: "The Spot Car-Repair System is a facility arranged to bring

D. A. Bessey

cars in need of repair to one central station, thus eliminating lost time in moving men, equipment, materials and tools to the cars. One-Spot Systems are designed primarily for making light repairs. It usually is advantageous to have at least one track for heavy repairs and for working on three-axle trucks. The facilities must be designed in cooperation with all departments concerned, with the architect or building engineer as the coordinators."

The above statement is the preface or the forward to the report "Design Criteria for Spot Car-Repair Shops" prepared by AREA Committee 6 last year. There are copies of the report available. They were re-printed by permission of the American Railway Engineering Association, published in AREA Bulletin #640 November-December, 1972, (Proceedings Volume #74) and approved for incorporation in Part #3, Chapter 6 - Buildings of the AREA Manual for Railway Engineering to be included in the 1973 Manual Supplement.

This report deals in design criteria. It deals with site consideration, track design, the buildings, mechanical equipment, the operation of the automatic devices and, of course, environmental control. The design of such facilities must involve the Operating Department, and, of course, the Car Department, Mechanical Department, and all facets of Engineering, Architectural, Structural or Bridge Department; electrical, signal, track department, and environmental engineers.

So much for design. Our primary objective today is to discuss the techniques and problems of construction.

The Spot Car Building, the car-progression system, the jacks and all related systems and equipment result in complex construction project. Just as the design of such systems require the coordinating of many departments, the construction process requires the coordination of many trades.

Today, Critical Path Methods and other computerized schedule systems are used for such projects to insure a fast, efficient construction process.

The nature of such a project requires that many construction processes are not only carried out at the same time, but it is necessary to coordinate many elements of the construction. As an example, the signal controls and the electrical control system are entirely separate. However, they must be interlocked and interconnected to form a complete control system. The construction of the track structure through the shop not only involves the placing of the track pads and the tracks, but it also involves installation of puller runways, cable chases, rip jacks, retarder and many other devices that become an intricate part of the track structure. Another example is the fact that piping for electrical service, air, oil, water and oxygen/acetylene must be integrated into the concrete slab and building construction.

There are 4 or 5 such facilities that are presently under construction, and I have conferred with the construction engineers and other personnel on the B.N., the U.P. and the S.P. and have compiled some slides showing various phases of construction.

Slide No. 1—This shows the site preparation and grading for the B.N. facility at North Town, Minneapolis.

Slide No. 2—Another view of the site preparation and some of the footing excavations.

Slide No. 3—Excavation for footings.

Slide No. 4—Timber piling for inbound sheave foundation. Sometimes when soil conditions are extremely poor it may be necessary to drive the piling at about a 15° batter.

Slide No. 5—This shows sheave foundation using reinforced concrete piling.

Slide No. 6—This shows the completed inbound sheave foundation which could be constructed either on top of timber piling or in some cases concrete piling and in other situations if soil conditions are adequate, no piling is necessary. This particular foundation is 20′ × 12′ × 8′ deep and is not on piling. The maximum horizontal loading on this sheave foundation is approximately 130,000 lb.

Slide No. 7—This is a picture of the completed sheave with the track structure in place. Note that the inbound cable passes through the web of the rail.

Slide No. 8—This shows the top of the outbound sheave foundation and counterweight tower. Note that the foundation for the counterweight tower is turned 45° to provide maximum surface against the horizontal loading. Normally, piling is not used on the outbound sheave because the loading is about 8 to 10,000 lbs.

Slide No. 9—This shows the outbound sheave in its completed form. Note that to the right side of the puller runway is a spring derail to protect the shop during switching operation. Note that there are substantial paved storage areas on both sides of the track. In this case blacktop is used in many areas where heavy castings are stored, consideration should be given to using concrete.

Slide No. 10—This is the same view looking from the other direction. This indicates an air-brake test area which in this installation is located on the outside of the building because the building is only 120' long and cannot be accommodated under roof. Note there is a car retarder to stop the car at this location to make the air test.

Slide No. 11—This shows a lot of things going on at one time. The track slab has been constructed and track structure is in place. They are installing the car progression-system runway and at the same time, building foundation and floor slabs are being constructed.

Slide No. 12—This is the same area with the work progressed to a point to where part of the slab has been poured.

Slide No. 13—This shows the track pads, jack foundation and the pocket on the left-hand side is for the retarder. The two outside jacks are 75-ton and the center jack is 150-ton. Note that the building was erected in this situation before the concrete work was completed. However, on the other hand, the jack machinery is set in place prior to the construction of the floor slabs.

Slide No. 14—This view shows the construction of the entire track slab through the building and the rail structure in place. The channel puller runway is placed over the trench on the right-hand side and the pipe for the cable return. The 4 devices, 2 on each side, are tie-downs for car straightening operation.

Slide No. 15—This is the car retarder which is a unit complete with air cylinders, stop rail, guard rail and running rail.

Slide No. 16—This shows the runway, the jack pits and the installation of the control panel has already begun at this point.

Slide No. 17—This is a picture of a control panel with the communication to the left, the signal controls are located on the top two panels and the electrical controls are in the bottom panel. Note just behind the panel you can see the retarder in its finished location.

Slide No. 18—This is a picture of a console-type control panel. The signal circuits are on the left and the electrical controls for the puller, jacks, retarder and door controls are on the right. As I mentioned before, it is necessary to coordinate the signal and electrical control circuits as they are interconnected and interlocked.

Slide No. 19—This is a rear view of the console indicating the numerous wires and relays.

Slide No. 20—I have a few more pictures showing the finished construction. This slide indicates the jib crane and hose re-assembly. The assembly, complete with electrical MG welder hanging from the frame and reels for air, water, oil, oxygen, acetylene and electrical welding.

Slide No. 21—This shows the maze of overhead piping to serve the reels and electrical components. This particular building is heated with infrared gas heaters. The building is not equipped with doors.

Slide No. 22—This is a picture of a 3-stall spot car shop. It is unique in

that two tracks are in one direction and the one track on the left-hand side is in the opposite direction. It was originally built using air-curtain doors.

Slide No. 23—Now I have a series of pictures showing the various stages of the construction of the building. This building is 150′ × 280′ including the 40′ lean-to. This building, which is fairly common for this type of facility, is a pre-engineered rigid-frame building. Setting Columns

Slide No. 24—Setting columns, concrete slab.

Slide No. 25—Reinforcing for lean-to floor.

Slide No. 26—Finished track through building.

Slide No. 27—Rigid frames set.

Slide No. 28—Lean-to framing.

Slide No. 29—Rigid frame and end wall.

Slide No. 30—Interior looking through rigid frame.

Slide No. 31—Excavation in building in background. 3½ million yards.

Slide No. 32—Rigid frame and purlins in place.

Slide No. 33—Same.

Slide No. 34—Looking at lean-to.

Slide No. 35—Pouring slab in lean-to.

Slide No. 36—Masonry wall.

Slide No. 37—Wall panels on lean-to.

Slide No. 38—Roof panels on lean-to.

Slide No. 39—Wall panels on building. Forced-hot-air heating system.

Slide No. 40—Wall panels on building.

The designer comes up with many new innovations and techniques relative to the construction of this type of project or any such project—Innovations and Techniques that not only provide a better facility, but greatly aid the men in the field carrying out the construction. This, of course, works both ways. The man in the field can develop construction techniques that when passed on to the designer, can change the whole concept of the design and the finished project.

President Bryant: Don, I would like to thank you on behalf of the Association for presenting a thorough and interesting report. If there are any questions, I am sure Don will be able to provide an answer. Well, Don, thank you, again.

Our next special feature is an illustrated address on "Special Design for Protective Cell and Floating in Vertical-Lift Span and Towers, Southern Pacific's Atchfalaya River Bridge." This address will be presented by Mr. F. T. Alley, who will be introduced by Mr. Tom Fuller, engineer bridges, Southern Pacific, San Francisco. Will Mr. Alley and Mr. Fuller please step to the platform.

Special Design for Protection Cell and Floating in Vertical Lift Span and Towers S.P.'s Atchafalaya River Bridge

By F. T. Alley

Engineer of Bridges, Southern Pacific, Houston, Tex.

Atchafalaya River Bridge, more commonly called Berwick Bay Bridge, is Southern Pacific's crossing of the Atchafalaya River in the State of Louisiana between Morgan City and Berwick.

To familiarize you with the general area, this slide shows the Mississippi, the Atchafalaya, Morgan City, Berwick and Highway 90 crossing approximately 1,500 ft. upstream of the railroad bridge.

The Atchafalaya is notorious for swift current, depth of 60 feet plus, unpredictable scour and hazardous construction conditions.

During the 1950's, an opening was made at old river and locks constructed at Port Allen allowing barge traffic a shorter route to New Orleans. Prior to this, fishing boats and other local craft were the primary users of the waterway at Berwick Bay. The shorter route plus the marine industry generated by off-shore oil brought an ever-increasing flow of river traffic through Berwick Bay swing-span opening, 112 ft. in width, located near the west bank.

F. T. Alley

Difficult route causes collisions

Downstream barge traffic had to change course from the center of the river to the west bank in the 1,500-ft. distance between the highway bridge upstream and the Southern Pacific bridge and negotiate a 15 deg cross-current through the narrow swing-span. This difficult navigation in some measure contributed to numerous collisions which forced closure to both marine and rail traffic in order to effect repairs.

Collisions, some of which are illustrated by these slides, damaged rest piers, swing-span and adjacent east span. The west rest pier shown here was sheared approximately 5-ft. below the water line with the top portion displaced three feet downstream and 1½ ft. west.

The 250-ton derrick barge shown here was used to move the top portion of pier back in place within two inches in each direction and the pier was doweled with 25 No. 18S reinforcing bars, which were pressure grouted.

In April, 1966, the Secretary of the Army declared Southern Pacific bridge a hazard to navigation under provisions of the Truman-Hobbs Act.

Modjeski and Masters, consulting engineers, were employed to design a new lift span with minimum horizontal clearance of 312 ft. and vertical

clearance of 75 ft. as illustrated by this slide. Contract was awarded to Massman Construction Company of Kansas City, Missouri and construction began in April, 1968.

To protect new and existing piers against scour, mattresses of willow trees, woven and tied with cables, were sunk in the area around piers 4 and 6. (Slides). You will note mattresses were sunk by unloading rock on top of them.

Massman Construction Company slip-formed the caissons instead of using the conventional method of forming, which proved to be very successful on this project. H-piles were driven to support guide frames for lowering the caissons (slides). Caissons were poured in 10-ft. lifts, using the bouyancy of the water and load-registering cable hoists to equalize the load on the guide frame. Slip forms were jacked by use of eight 250-ton hydraulic jacks, power-operated from a one-man console unit as concrete pours were made and the 36-ft. square caisson was lowered into the river to founding elevation.

During the lowering of the caissons, it was necessary to equalize load on the guide piling. This was done by eight air-operated, load-registering cable hoists. The maximum load transmitted to the guide frame was calculated to be 800 tons or 100 tons per hoist. As the caisson was poured, cofferdam sections were attached. Slide shows slip form on the left and cofferdam section on the right.

These slides show the cutting edge of the caisson and the four dredge wells in the caisson which was founded at −135. During the lowering of the first caisson, obstructions were encountered which were found to be old bridge piling from the original bridge built in 1880. Excavation was made in area of the other upstream caisson and 15 timber piling were extracted by use of viberatory hammer (slide) and an extension to connect hammer to piling for extraction. (Slide).

On completion of caissons, pier shafts were poured inside cofferdams (slides) and cap constructed with concrete placed around trusses connecting the pier shafts. (Slides).

Spans floated out, and in

As pier construction progressed, lift-span and lower portion of tower spans were erected on barges (slide). On September 5, 1970, (slides), during a 14-hour period, the two truss spans were floated out and the new span floated in place. This was the only interruption to rail traffic during the construction period (slides .

Construction of towers, installation of 16-ft. diameter sheaves and machinery followed (5 slides). The lift-span was opened to navigation on April 13, 1971, without the protection of a completed fender-protection system.

The fender system was designed to consist of four 30-ft. diameter, rock-filled, sheet-pile cells. Unfortunately, during December, 1970, the upstream east cell overturned while filling was taking place, with cause attributed to foundation failure.

A study of the stability of the other three cellular dolphins resulted in reinforcement of the upstream west cell by providing additional support of 36-in. diameter, concrete-filled, hollow steel piles driven outside the cell and secured to the cell by a steel frame encased in a 5-ft. thick concrete cap placed within the cell. (slide). The two downstream cells were filled with shell to decrease the foundation load.

The upstream east cell was replaced by a polyhedron shaped concrete mass weighing approximately 700 tons supported by 15 - 36-in. diameter concrete-filled hollow steel piling. (Slide).

Barge tow strikes dolphin

During April, 1972, a tow with six loaded barges struck this dolphin displacing the concrete mass 6-ft. downstream of its original location. Divers' inspection revealed that 10 of the 15 piles were broken, dictating that re-

moval and replacement of the dolphin was necessary as soon as practical.

Removal was accomplished by use of shaped charges placed on piles at predetermined depth (slide) and applying the pull of tugs totaling 13,200 h.p. to control placement of mass on the river bottom. (Slides).

A replaccemnt dolphin, which we call the "hydrocushion," was designed to absorb a portion of the impact forces using water to assist in retardation upon collision.

(Slide). The support structure consists of nine 36-in. diameter hollow steel piles. Piles were sand filled to elevation +8 or approximately 6 ft. above normal water level and reinforced concrete above in order to provide rigid support for bracing. Eight piling were driven with 2-inch batter per foot with exception of center pile, which was driven plumb. Structural steel frame of eight W14 × 237 beams is fabricated to resemble a "wagon wheel" which is secured to the substructure by means of anchor bolts, circumferential welds to all nine piling, and bracing from spokes to piling.

Can withstand a high impact

Hundred-ton chains and shackles are attached to the spokes to suspend the concrete sections. (Slide). The concrete sections shown are 3-ft. thick and 18-ft. in height weighing 104 tons each. Sections are secured together by W36 × 245 beams bolted with 1½-in. diameter high-strength bolts to form a 36-ft. diameter ring. The bouyant weight of the concrete ring, assuming 10-ft. submerged, is 317.7 tons and the weight of water contained within the ring is 220.3 tons. This combined weight of 538 tons can be moved 5-ft. on impact absorbing in excess of 3,000 foot-kips of energy before bending stresses of piling substructure become excessive.

Construction of this structure and fender extension began in August, 1972. In spite of five collisions during November and two during December, structure was ready to hang concrete sections on December 27. During the process of hanging the first section, a wire rope broke and the section was dropped to the river bottom. Until August of this year record flow in the Atchafalaya River would not allow divers to locate and retrieve this section and current was such that continued work on the proejct was impossible. Eight additional collisions occurred during the period of January through April with minor damage to the structure. (Slides).

The concrete-ring section on the bottom is scheduled to be retrieved and hung in place along with the other three sections during the first week of October. It is our sincere hope that the hydrocushion dolphin will afford prolonged protection at this location far superior to any heretofore provided.

On closing, these slides show an incident which occurred in January, 1972. A tow moving downstream evidently lost control making an opening through the 232-ft. truss span just east of the new lift span opening. Protection against this kind of incident is not possible and such accidents can only be controlled through establishment and rigid enforcement of rules and regulations governing navigation through structures.

President Bryant: Mr. Alley, you have given us a close-up, inside view of some of the problems involved in placing protective cells and the solution to these problems. We are truly grateful for your coming to this meeting and making your presentation. Thank you.

The last feature for today's session is one which has aroused some controversy among railroad bridge people. There are those who say "It won't work"—while others say that voids in timber piling can be grouted as easily as grouting masonry structures. The subject "Grouting Timber Piles on the Frisco" will be presented by Mr. L. D. Green, associate structural engineer, Frisco, Springfield, Mo. Larry Green,

though young in years—33 is old in education and experience. He earned a B.S. and M.S. degree in Civil Engineering from the University of Missouri at Rolla and worked as a research associate at the University of Illinois for two years while pursuing further graduate work. He then worked for five years in structural design and as a consultant, before joining the Frisco in the Fall of 1970. Besides being so well educated, he is also a practical man, at present in the process of constructing his own home in the Ozarks. Will Mr. Green please come to the platform.

Grouting Timber Piles On the Frisco

By L. D. Green

Associate Structural Engineer, Frisco

When timber piling are treated with preservative, the higher concentration is nearer the outside; therefore, decay tends to initiate near the center and work outward, leaving a void in the piling. A piling is considered a reject when it has less than 6 in. total sound wood, adding the thickness of both sides. Of the 23,000 panels of wood bridges in the Frisco System, about 85% have piling driven before 1931, which makes the piling more than 40 years old and therefore somewhat suspect.

However, age is not always the most critical factor. Some piling driven during the war years of the '40's is in worse condition than much older piling, probably due to inferior treatment processes. Other factors affecting rate of decay are initial quality of wood, local conditions, and climate. On the Frisco System the climate ranges from dry to extreme wet. Frisco uses the services of the Osmose Company to survey its bridges to determine the extent of decay and also to "treat-in-place" to arrest further decay.

The Frisco has a program for systematically replacing timber trestles with more permanent-type bridges, and

L. D. Green

normally we do not drive wood piling except in emergencies, burnouts, etc., or as helpers in strengthening programs. The current (1973) Bridge Program is replacing 571 panels of timber trestle and we will eliminate another 300 or so panels with retirements whether by filling or otherwise.

So it looks as if we will lower the total number of panels of trestle by less than 1000 this year.

A number of additional factors besides decay of piling enter into the determination of which bridges will be replaced in a year. Riding conditions, whether it catches drift, maintenance records, etc. are also considered and of course the lines having higher volumes of traffic get priority. It is evident that some timber trestles must be repaired to maintain them in service until they come up for replacement. Conventional repair, that is posting, is slow and expensive from the labor standpoint, and good timber is becoming increasingly harder to obtain and more expensive. All of these factors lead to the search for alternative solutions to the problem of repairing decayed piling, and one of these was the idea of injecting grout into the voids.

For a number of years Frisco forces have been using the intrusion-grouting system in connection with masonry structures and have had considerable experience in that line. So it was perhaps not too unusual to extend this process to decayed piling (previously "treated-in-place") with the idea that the void area could be filled with grout to replace the missing timber.

Test grouted specimens

Credit must be given to Mr. Bryant for pursuing this idea. He prepared six test specimens which were 5-ft. lengths of piling removed from service because of decay (slide). Two of these had been pressure-grouted in the void areas and the other four had not. One grouted specimen (slide) and one non-grouted specimen failed in the range between 60 and 65 tons. The other four specimens did not fail within the limits of the machine (100 tons). Because of the limitation of the testing machine and because of the wide variation in pile sections, further tests on full-sized piling were not attempted. After these tests all six of the specimens were split open to show the extent of the voids. In both grouted specimens, the grout apparently filled the void completely (slide), as the grout core conformed with all the irregularities of the void (3 slides).

To simulate the effect on smaller piling which could be tested within the capacity of the testing machine, 5 - 4-in. diameter wood posts 1-ft. in length were tested. Two posts had 2-in. dia. holes drilled full length, 1 grouted and 1 not grouted—2 had 2-in. dia. holes drilled 6-in. deep with tapered points, 1 grouted and 1 not grouted—and one was left solid. In these tests, the grouted specimens failed at a higher load than their non-grouted counterparts, with the failure load for the grouted specimens approximating that of the solid post.

The decision was made to apply this idea to a number of full-sized structures under actual load conditions. The first such structure was Bridge L-173.3 over the Neosho River near Miami, Oklahoma. After one year, no evidence of any distress of any sort in the grouted piling can be detected.

To date, three timber bridges have received the grout treatment. Some modifications to the procedure have been made and are being made as experience is gained in this area. The following slides were taken during the week of July 23-27 at Bridge R-777.0 over Beaver Creek between Kimbrough and MacMillan, Ala. (slide). It has a 14-panel trestle north approach, 2 - 33-ft. deck-plate girders on pile piers and a 4-panel trestle south approach, all open deck. It was driven in 1930.

Equipment and Mix

All equipment (with the exception of electric hand drills) was air-operated. Air was supplied by a Gardner-Denver 185 cfm. Rota Screw air compressor powered by a gasoline engine (slide). The mixer was a single-tub air-mixer Model SA-12 from Masonry Equipment Co. (slide) and had a water-batching tank on it. The mix was the following:

13 gal. water (pre-measured by batching tank).
2 - 94# bags Portland Type 1 cement.
1 - 75# bag Alfesil Fly Ash from Conc. Chem. Co.
1 - 2 2/3# bag Intrusion Aid from Conc. Chem. Co.
16 Scoops (about 4 cu. ft.) sand.

This mix makes a non-shrink grout and one batch makes about 60 gal. of grout. On the average it took about one batch of grout to inject one bent. (Note the grout injection nozzle to the right of the mixer). The mixing tub fed a 2½-in. Simplex Grout Pump (slide).

The mixture was fed into the intake funnel of the pump through a screen so that any lumps coming from the mixer could be broken up and worked through the screen or discarded. The pump operated continuously with the grout being recirculated when not being injected into the piling. Water for the mix and for clean-up operations was supplied by a Gardner-Denver air-actuated water pump Model AB 1500 (size 3 × 2 × 3) (slide). The screened intake for the water pump was placed in the stream which ran under the bridge. (A spare water pump is considered a vital piece of equipment to have on the site to insure that all equipment and hoses could be cleaned up in case of a breakdown in the first pump.

The air compressor, mixer, grout pump and materials for the mix were located on a platform at the end of the bridge (slide). We are planning to have them high-rail mounted in the future and perhaps to have a portable platform also. The three hoses visible in the slide are: (1) an air line to the water pump located at the edge of the stream; (2) the water line from the pump to the water batching tank, and (3) the grout line from the grout pump to the injector nozzle (slide). Here you see the water pump again with the air and water lines connected to it. The electric drills and portable generator were a standard part of the B&B gang's regular equipment.

Operation

The first step (slide) in the grouting operation is the drilling of holes into the void space (slide). The report from the Osmose Co. survey is studied to determine the location of the voids. A number of ⅜-in. dia. holes are then drilled into the void area. The extent and size of the void is verified by use of a shell thickness indicater (slide). All voids greater than 3-in. in diameter will be grouted and those less than 3-in. in diameter will be ignored, except of course if a void less than 3-in. in diameter connects with a larger void it will be grouted in the process of grouting the larger void.

A close-up view of the indicator is shown on the next slide (slide by Osmose Co.). The small holes also serve as relief openings for the grouting operation and indicate the level of the grout as will be seen later. Pole climbing equipment is used to reach higher parts of the bridge (slide). As before, the thickness of the shell is checked (slide). Larger holes (1¼-in. dia.) are also drilled into the voids for placement of the grout injection nozzle (slide). (A new drill much lighter in weight has been obtained since this slide was taken.)

Where the thickness of the shell is indicated to be less than 3-in., 60d nails are driven into the void (slide). A washer is placed on the nail before driving to increase the bearing area under the head (slide). Nails are used instead of deformed dowels because they don't require drilling and are readily available (also they cost less).

If the thin shell shows considerable cracking to indicate a possibility of difficulty in containing the grout, it is banded with metal packing crate bands (slide). Another view of the banding operation (slide). This type bander required the bands to be deformed with a pointed punch (slide). This slide shows the bander a little more clearly. Another view of the nailing (slide). (Note the washer on the nail). The next slide shows a bent

drilled, banded and nailed ready for grouting (slide).

On this job the voids were washed out with water prior to being grouted (slide). It is my understanding that current procedure is to blow them out with air. (This slide is included anyway because it shows the grout nozzle in place more clearly than the others I have). The next two slides are also of the washing operation, but are included because they show evidence of rather extensive void systems (2 slides). We clean out the voids by inserting the injector nozzle near the top of the void.

For grouting, the injector nozzle is inserted and tightened in one of the large-diameter holes toward the bottom of the void. As grout is pumped into the void, it escapes at the other holes (slides). In this slide, grout is just beginning to escape from the small hole near the center of the picture. As soon as the grout begins to escape a treated wood plug is driven into the hole (slide). In this slide, the workmen are getting ready to plug one of the large holes. Safety goggles are a necessity for this operation (slide).

The grout is injected under pressure and sometimes escapes unexpectedly from unexpected places. Another view of the grouting operation (slide). Grout is running out from a hole on the near side of the pile while the workman is plugging a hole on the back side. Large cracks were stuffed with paper and smaller cracks could often be sealed by rubbing dry cement into them. Sometimes a crack will begin to open due to the internal pressure of the grout. When this happens, the grouting operation has to be suspended temporarily until the pile can be banded.

(Slide In this slide a void in the top of the cut-off piling is being grouted (note the paper stuffing). This is an old posting job, but only recently has it received the in-place treatment. A concrete collar will be placed later around the joint (slide). Sometimes the void extends up to the cap.

Concrete Collars

Where a pile has previously been posted at or near the ground line, the joint is reinforced with a concrete collar. First a number of nails are driven into the piling above and below the joint (slide). (This is a more recent posting job). Then a piece of wire mesh reinforcing is placed around the joint and tied to the nails (slide). (The piling, reinforcing, etc. must be washed off before grouting).

The forms are next (slide). Another view of forms and reinforcement (slide). The forms are filled with aggregate (slide) and injected with grout (slide). A special nozzle was made from a length of ¾-in. pipe for this purpose. When full, the top was struck off (slide). The collar was allowed to set for a couple of days (slide) and the forms were removed (slide). The finished collar (slide) provides reinforcement for the joint.

Men required

The crew on this job consisted of a Division B&B gang (foreman and 6 workers) under supervision of a supervisor from the System Bridge Department who was familiar with the operation and equipment. One man operated the mixer, one man operated the grout control valve and tended the grout pump. Two men were required to operate the nozzle and plug holes, and the remaining men were available for drilling, handling, nailing, etc.

After one year

The following two slides were taken Sep.t 6, 1973 at Bridge L-173.3 over the Neosho River near Miami, Okla. (slide). This bridge, as was mentioned earlier was selected as the first bridge to receive this treatment and these slides show how it looks after having been in service for one year following the treatment. A typical pile (slide) which had a thin shell (as evidenced by the nailing that has been done) seems to be functioning perfectly.

Summary

Evidence to date seems to indicate that this method of pressure grouting the voids in piling (after having previously given them in-place preservative treatment) provides a structurally sound and economical method for upgrading piling which has experienced some decay. In fact, by this method some piling can be repaired which would normally be considered rejects. At the present, the Frisco is satisfied with the performance of such piling and plans to continue and expand this practice.

President Bryant: Thank you, Larry, for an extremely interesting report. Please accept the thanks of our Association.

This concludes the meeting for today. We have been fortunate to have had so many timely and interesting reports and each speaker deserves the appreciation of this, our Association.

Before adjourning, I would like to remind you of the REMSA Banquet tonight at 7:00 P.M. Most of you need no reminding, but for those who are here for the first time, may I add that the Annual Banquet, sponsored by our good friends of REMSA, is the social highlight of our convention. If you have not received a ticket, you may secure one at the Registration Desk which is still open.

The final session of this convention begins at 9:30 A.M. tomorrow morning in Parlor "A", Williford Room. It will include our business session, two Special Committee reports and the election of officers. Each one is urged to attend. This meeting is now adjourned.

MORNING SESSION

September 19, 1973

Williford Room . . . Parlor "A"

President Bryant: Will the meeting please come to order. Good morning, members and guests. Welcome to the final session of the 78th Annual Convention of the American Railway Bridge & Building Association. The total registration at this time is 748. The REMSA banquet, with its exceptionally delightful entertainment, was attended by 927 people last evening.

BUSINESS SESSION

If the officers and directors of our Association will please come forward, we will begin our business session.

(Officers and directors came to platform)

The following reports concerning the

business affairs of the Association will be presented by the responsible officer or committee chairman. These reports are for the information and enlightenment of each Association member. It is hoped that interest will be stimulated so that each person is a better informed member. No doubt questions will be raised in your mind and an attempt will be made to answer all questions you may have. However, it will be appreciated if you will withhold your questions until all business reports have been presented.

Report of Secretary

You will recall that our Secretary, Mrs. Ann Wilson, was unable to be present during the introduction of officers, Monday afternoon. She is now with us and will present the Secretary's report. It is with considerable pleasure that I present our most competent Secretary, Mrs. Ann Wilson.

President Bryant: Thank you, Mrs. Wilson.

Secretary's Report

Period September 15, 1972 to September 10, 1973

ACTIVE MEMBERSHIP:			
Total Active Members, September 15, 1972		469	
New Active Members since September 15, 1972		35	
Reinstated—Paid back dues		2	
		506	
LESS: Resigned account retirement, etc.	8		
Transferred to Life	7		
Reported deceased	4		
Dropped for non-payment of dues	28	47	
TOTAL ACTIVE MEMBERS			459
ASSOCIATE MEMBERS:			
Total Associate Members, September 15, 1972		76	
New Associate Members since September 15, 1972		5	
Reinstated—Paid back dues		1	
		82	
LESS: Resigned account retirement, etc.	3		
Transferred to Life	1		
Dropped for non-payment of dues	5	9	
TOTAL ASSOCIATE MEMBERS			73
LIFE MEMBERS:			
Total Life Members—Septemper 15, 1972		145	
Transferred from Active Membership		7	
Transferred from Associate		1	
		153	
LESS: Reported Deceased	11		
Transferred to Honorary	1	12	
TOTAL LIFE MEMBERS			141
HONORARY MEMBERS:			
Total Honorary Members—September 15, 1972		9	
Transferred from Life to Honorary		1	
TOTAL HONORARY MEMBERS			10
TOTAL MEMBERSHIP ALL CLASSES—SEPTEMBER 10, 1973			683

Report of Treasurer

Mr. Huffman, will you please present the Treasurer's report.

President Bryant: Thank you, Mr. Huffman.

Treasurer's Report

Period September 1, 1972 to August 31, 1973

Balance August 31, 1972		$3,422.77
RECEIPTS:		
Dues	$3,409.23	
1971 Advertising	1,163.77	
1972 Advertising	6,205.22	
1972 Convention Receipts	163.73	
Miscellaneous	22.55	10,964.50
		$14,387.27
DISBURSEMENTS:		
Salaries (Secretary & Assistant)	$2,788.80	
FICA (On payroll)	156.03	
Office Rent, Telephone, Etc.	514.13	
Stationery and Printing	486.60	
Postage	277.35	
Office supplies	136.74	
1971 Advertising (The American Publishing Co.)	766.19	
1972 Convention Expenses	130.00	
Miscellaneous	235.75	
State of Ill., Unemployment Tax	56.48	
1972 Advertising (The American Publishing Co.)	934.01	
Federal Unemployment Tax	8.82	
1972 Proceedings	375.00	
Membership Certificates & Awards	172.29	$ 7,038.19
BALANCE—AUGUST 31, 1973		$ 7,349.08
HOMEWOOD FEDERAL S/L ASSN.		7,693.01
		$15,042.09

Report of Auditing Committee

Mr. Schlaf, chairman of the Auditing Committee, will now present the results of the audit by his Committee.

Report of Auditing Committee

TO MEMBERS OF THE AMERICAN
RAILWAY BRIDGE & BUILDING ASSOCIATION

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1972 to August 31, 1973, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
E. R. Schlaf, *Chairman*
H. F. Lucas
H. M. Wilson

President Bryant: Thank you, Mr. Schlaf.

You have heard the reports of the Association Secretary, Treasurer and Auditing Committee. Is there any discussion regarding these reports?

Hearing none, I will entertain a motion that the reports be accepted as given. (Motion made)

Is there a second? (Motion Seconded)

It has been moved and seconded that the reports be accepted. All in favor say "Aye". All opposed say "No". The motion is carried and the reports are accepted.

Report of Resolutions Committee

Will Mr. Gould, Chairman of the Resolutions Committee please give his report.

Report of Resolutions Committee

Mr. President, at the close of this 78th Annual Convention of the American Railway, Bridge and Building Association, the Resolutions Committee offers the following resolutions:

BE IT HEREBY RESOLVED that the thanks of the Association be extended to Dr. Kenneth Hildebrand for his message of spiritual assurance.

BE IT FURTHER RESOLVED that the thanks of the Association be expressed to the prominent speakers who gave their time and so capably shared their wisdom and counsel with us, especially AREA President, Mr. D. V. Sartore, Mr. Alan Boyd, president of Illinois Central Gulf, Mr. R. J. Gill, Staff Engineer, DOT High Speed Ground Test Center, Mr. R. D. Shaver, superintendent of safety - system, Atchison, Topeka, Santa Fe, Mr. R. C. Grayson, president, St. Louis-San Francisco, Mr. E. R. Schlaf, superintendent fire prevention, Illinois Central Gulf and Dr. Carl S. Winters.

BE IT ALSO RESOLVED that the Association express its appreciation to REMSA and to REMSA President, Mr. L. A. Grego and his staff who so generously provided us with a most splendid banquet and evening of entertainment.

BE IT FURTHER RESOLVED that our thanks be expressed to Mrs. N. D. Bryant and Mrs. R. H. Peak and their committees, for their efforts in arranging registration and entertainment for our wives, and to the untiring efforts of the ladies who assisted in registration.

AND, BE IT FINALLY RESOLVED that the Association express its thanks to its Chairman and their committees for their fine work in preparing the reports which were presented at the convention, also, to Simmons-Boardman Publishing Corporation and its representatives for their capable assistance, to the Chicago, Rock Island and Pacific Railroad, Illinois Central Gulf, and the Chicago & North Western Transportation Company who provided assistance at the registration desk, to the management and staff of the Conrad Hilton Hotel for their attentive cooperation and warm hospitality, as well as to the members of our executive committee and to our President, Mr. N. D. Bryant, who has spent so much of his own personal time and effort in guiding the affairs of our Association over the past year.

Mr. President, we recommend these resolutions be made a part of the official record of this association, and that copies be presented to all concerned parties.

Respectfully submitted,
Donald C. Gould (signed)
D. C. Gould, *Chairman*

President Bryant: Thank you, Mr. Gould.

Report of necrology committee

The Chairman of the Necrology Committee, Mr. Corbett, was unable to be here so Mr. Hughes, a member of this Committee, will present this report.

Report of Necrology Committee

1972 - 1973

To the President and Members of the
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION

It is with grief and regret that we report the known loss of fifteen (15) members through death during the past year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, please report their names to the Secretary. The following have been reported since our last Annual Meeting in September 1972.

ACTIVE MEMBERS	TITLE—LOCATION	JOINED	DECEASED
H. J. Madvig	Assistant Engineer C.M.S.P.& P. Railroad Minneapolis,Minn.	1959	1971

ACTIVE MEMBERS	TITLE—LOCATION	JOINED	DECEASED
E. Osland	Office Engineer A.T.& S.F. Ry. Co. Chicago, Ill.	1961	1973
S. G. Wintoniak	Staff Engineer Penn Central Trans. Co. Philadelphia, Pa.	1953	1973
W. J. Witek	Asst. Chief Carpenter C.M.S.P.& P. Railroad Chicago, Ill.	1968	1972
D. W. Converse	Bridge Engineer Akron, Canton & Youngstown R.R. Akron, Ohio	1940	1972
H. M. Dick	Supvr. of Structures Pennsylvania R.R. Harrisburg, Pa.	1942	1973
A. A. Hampton	B.& B. Supervisor Missouri Pacific R.R. Monroe, La.	1947	1972
J. E. Heck	B.& B. Supervisor Chesapeake & Ohio R.R. Ashland, Ky.	1938	1972
H. E. Jackman	Master Carpenter Baltimore & Ohio R.R. Chillicothe, Ohio	1944	1971
W. S. Lacher	Secretary American Railway Engr. Assoc. Chicago, Ill.	1922	1972
L. A. Luther	Service Engineer Ingersoll Rand Co. Palo Alto, Ca.	1945	1972
S. K. Mason	Chief Engineer Texas Mexican Railway Laredo, Texas	1950	1973
W. J. Phillips	Bridge Inspector Southern Pacific Trans. Co. Oakland, Ca.	1925	1972
C. R. Taggart	B.& B. Supervisor New York Central R.R. Indianapolis, Ind.	1935	1972
J. L. Varker	Special Engineer Delaware & Hudson R.R. Carbondale, Pa.	1936	1972

Respectfully submitted,
R. K. Corbett, *Chairman*

President Bryant: Thank you, Mr. Hughes.

Presents appreciation certificates

Each year, three new Directors are elected to serve our Association; and each year, after three years of devoted, donated service to the Association, three Directors leave the Board. It was felt that these men deserved some form of recognition for the man hours of service they had given our Association. Consequently, certificates have been made to present to these Directors as recognition by this Association.

Will Tom Fuller, immediate Past President, please come forward.

Tom, I just explained to the membership the thinking behind our decision to present certificates of recognition to the retiring Board members. However, I purposefully left something out. You, more than any man serving

on the Board, know of the extra hours required to serve for three years as Diector. Also, you know of all the extra time required to serve an additional three years as an officer. Six years is a long time to devote to an organization, and that is the time you have so generously given to the American Railway Bridge & Building Association. This time given as Director, Vice President and President! I should also add to this a seventh year, serving our Association as Past President. I personally, appreciate all of your guidance and help and, speaking as the Association President, I wish to thank you for the membership. It is with great pleasure that I now present to you this certificate.

Fuller thanked Association.

Tom, since you are already up here, I'd like to request you to assist in one more thing. Will you present these certificates to those retiring directors who served last year under your Pesidency.

(Fuller called Chambers, Frame and Hobbs to front and presented certificates).

Thank you, Mr. Fuller. I feel that this Association owes a great amount of thankful gratitude to these men.

Will Messrs. Iwinski and Pritchett please stand. Mr. Corbett, as previously mentioned, could not be with us today.

Jerry, Jim—we realize that no words, spoken or written, can adequately repay you for the many, many hours you have given to this Association during the three years you have so conscientiously served as Directors. We know that you have taken time away from your families, from your friends, from your job—and yes, from yourself—to conduct the affairs of our Association. These pieces of paper can never return those lost hours to you, but what these pieces of paper do say to you is that all 700 plus members of our great organization appreciate what you have done, that we thank you from the bottom of our hearts for your contribution and that we shall be eternally grateful for you having served as a Director!

(Presented Certificates)

Is there any further new business? If not, the business session is adjourned and the Officers and Directors are excused.

The next item on the agenda is the report of Special Committee No. 2—"Precast Concrete Caps for Timber Bents, Steel and/or Concrete Piling". The chairman of this Committee is Mr. Jim Payne, division engineer, Frisco, Memphis, Tenn. The sponsor is Mr. J. W. Davidson. Will these two gentlemen and all members of their committee please come to the speaker's table and present their report. You are urged to ask questions, or provide additional information following the report.

Precast Concrete Caps for Timber Bents, Steel and/or Concrete Piling

Report of Committee

COMMITTEE—J. Payne, *Chairman*, division engineer, S.L.-S.F., Memphis, Tenn.; G. L. Tysinger, *Vice Chairman*, asst.b&b supvr., Clinch., Erwin, Tenn.; J. W. Davidson, *Vice Chairman*, asst.dir.br.engrg., B.N., St. Paul, Minn.; J. W. DeValle, ch.engr.-br., Son., Atlanta, Ga.; T. L. Fuller, engr.br., S.P., San Francisco, Calif.; and J. M. Helm, designer, I.C.G., Chicago.

J. Payne

The first thing that has to be considered in the use of precast-concrete caps is the determination of when a bridge is to be considered for this kind of construction. In taking a broad survey of most of the railroads throughout the United States, it was decided to differentiate between timber bridges and the more permanent type bridges.

In dealing with timber bridges founded on timber piling, precast-concrete caps are used both in the maintenance of existing bridges and in the construction of new timber bridges. Relatively few railroads are today still programming large-scale replacements in kind of existing timber bridges. Many of these railroads are using precast-concrete caps on timber piling because the precast concrete cap will resist crushing on the pile head and also will provide a more uniform load distribution to the piling.

The installation of a precast-concrete cap on a new bridge is somewhat diffent from the installation of a precast-concrete cap on an existing bridge. In new construction the caps may be delivered to the bridge site, unloaded and subsequently installed using the bridge crane that drives piling for the bridge. All of this is done prior to the deck being constructed. In this installation the anchoring of the cap to the piling presents no problem as the cap is drifted to the piling through precast holes in the cap. The new chord, of course, is anchored to the cap by means of hardware, such as angle irons, etc. Details of the anchoring will be discussed later in this report.

The use of precast-concrete caps on existing timber bridges is somewhat different in nature, as more things have to be taken into consideration. Several railroads have gone to the exclusive use of precast-concrete caps in maintenance, while a number of railroads only use precast-concrete caps in an out-of-face replacement procedure whereby they install all concrete caps and then use the good timber caps on secondary main lines and branch lines or other locations.

One question came up as to whether it is feasible to spot concrete caps in bridges only at locations where the cap is bad. Different opinions were reported by various railroads on this, largely dependent on the availability

of suitable work equipment for handling the heavy caps.

Need Hi-Rail crane

The railroads that use precast-concrete caps exclusively in their bridge maintenance, do so mainly because their bridge gangs are equipped with a Hi-Rail crane capable of handling the precast cap. Consequently spotting in of the caps presents no problem. On railroads where the bridge gangs are not equipped with a Hi-Rail crane, replacing a timber cap with a concrete cap would present a problem, and consequently they would probably use a wood cap in an emergency situation. However, on these roads where a bridge had several caps that were progammed for replacement, prior arrangements would be made to have a crane available to spot in the concrete caps in the bridge. As an example, say a 20-bent timber bridge had six or seven bad caps. Practically all railroads would feel that this would justify shipping six concrete caps to the bridge and making a crane available for the B&B gang to install them.

Most railroads make no distinction between open-deck pile and ballast-deck pile trestles in determining where concrete caps should be used. However, the installation of the cap itself is entirely different, particularly the anchoring of the cap to the piling and to the chord. Railroads that are using the precast-concrete cap, or are thinking of using it in the future, generally make no distinction between main lines. secondary main lines or branch lines, having gone exclusively to their use. Several bridge engineers estimate that the cost of a concrete cap installed is probably 50% greater than a timber cap but they believe that the greater strength of the concrete cap and the advantage of strengthening the bridge, as well as longer life, is well worth the additional cost.

However, the problem of getting the concrete cap to the bridge site always came up when discussing the use of precast cap with the various railroads, as the weights of the precast cap for timber bridges varies from 2400 lb up to 3800 lb. Most railroads handle this problem without any difficulty since they normally determine in advance on which bridges they are going to use precast-concrete caps. The caps are received from the precast plant in gondola cars and are then unloaded at the bridge site by the use of a crane with the required lifting capacity. The caps are unloaded from the cars onto the ground at the bents that are to receive the cap unless, of course, water prevents this, in which case they are unloaded at the end of the bridge. On the railroads that use precast caps for all maintenance and emergency work, caps are distributed at various locations on the railroad and can be delivered to the bridge either by the use of a Hi-Rail crane, heavy-duty push cars or other means.

In the installation of the cap itself, most railroads seem to use a Hi-Rail crane with an average of 8000 lb lifting capacity. Three frequently reported machines are the Austin Western Hi-rail crane, the Bantam Ri-Rail crane or the Kershaw Bridge Handling Crane. Most of these cranes are a part of the normal B&B gang's equipment. However, the railroads that do not have these cranes as a standard tool within the B&B gangs provide a system machine, such as a Burro crane or a bridge crane.

Installation is routine

In the actual installation of the precast cap itself, the jacking the deck up off of the bent that is to receive the cap, is routine work that has been done for years, and the same procedure applies for both precast caps and timber caps. After the timber cap has been removed, the pile heads are cut to insure a smooth surface and to provide for the greater depth of concrete cap. The cap is then lifted from the ground, set on top of the pile heads and lined up for anchoring. Drift pins are next

driven down through the precast holes in the cap into the piling with exception of piling that are under the chord. At these locations the cap is anchored to the piling by the use of some type of pile strap that will be shown on a typical anchoring sketch. The chord is then let down on top of the cap.

There are severel methods of anchoring the chord to the cap and each railroad seems to handle this differently. One possible method is by the use of hold-down anchors that are bent at 90 deg and bolted to the precast holes to the cap on one leg and the other leg bolted to the chord by use of a drive spike or leg screw. Another method uses a ¾-in bolt passing through the chord. A sketch shows a typical installation. Also shown are typical design sketches for the precast-concrete cap as well as sketches showing the anchoring of the cap to the chord and the cap to the pile.

In summary, most bridge engineers wholeheartedly agree the precast-concrete cap is the best one available for use on timber piling for handling today's heavy wheel loading. Some railroads are not using precast concrete caps simply because the bridge gangs are not equipped with the proper crane to handle the cap. In some cases they are not doing sufficient advance planning to determine when the timber caps should be replaced and, consequently, they may not have the concrete cap available if failure occurs.

Most railroads agree that it takes no special tools to handle concrete caps with exception of a crane, as the other tools that are needed, such as impact wrenches, drills, etc. are standard tools of a bridge gang. It is felt that if railroads would furnish B&B gangs with some type of hi-rail crane capable of handling an 8000-lb load that the use of precast concrete caps would become as common as timber caps. Most railroads agree that it does not take any more men to handle the concrete cap if you have the crane with which to handle it. The roads that do not provide a crane for their B&B gangs take the position that a B&B gang with some type of a crab car or light duty winch can handle a timber cap.

Installation on steel H-piles

The next type of construction involves the use of precast concrete caps on steel H-beam piling. Most railroads that use precast caps on steel piling confine these to new consruction where timber bridges are replaced by a permanent type structure. However, the bridge engineer on a southern railroad reports his road is using a regular precast-concree cap on steel H-beam piling in maintenance work. They do this where a bent must be completely replaced, either because of its condition or because of a wash-out. This particular railroad will redrive the one bad bent in the timber bridge that is bad with steel H-beam piling. Since the panel length remains the same as for a timber bridge, it uses a regular precast-concrete cap of the same type used on timber pile bents. However, they take a ¼-in plate of the same width and length as the cap and bolt it to the cap with high tension steel bolts using precast holes in the cap. The cap is then set on top of the steel piling which have been cut to the proper elevation and the steel plate is welded to the steel H-beam. Of course, the chord is anchored to the cap in the same manner as if it were a timber bent. We could not find a wide range of use for precast concrete caps on steel piling.

One of the large western railroads has gone exclusively to the use of precast-concrete caps where they drive H-beam piling. The bridge engineer of this particular railroad explained that they planned to build concrete structures with a minimum of field labor. Everything possible is precast to eliminate forming, rebar placement and the pouring of concrete in the field. They normally use steel H piling of weathering steel. However, where climactic conditions or the presence of water exists the year 'round make weathering steel unsatisfactory, they

drive steel pipe piling insert a rebar cage and fill the shell with concrete. This is the only field poured concrete that they use.

The precast caps are designed for each bridge, the size depending on panel length and the load the cap is expected to carry. The cap is precast on top of a ¾-in plate that is cast to the cap by the use of Nelson stud shear connectors. Of course, the size of the cap and the reinforcing steel would depend on design factors. These caps are precast with hooks for handling with a crane in the field. After the concrete is poured in the steel pipe piling then the plate is welded to the steel pipe to anchor the precast cap to the concrete-filled pipe piling. This seems to be the typical design for a pre-cast concrete cap on steel piling. With few minor variations, all railroads using this type of design have connected the plate to the steel piling by using a ¼-in fillet weld.

The use of precast-concrete caps on concrete piling is almost nonexistent in the railroad industry at this time. There have been several railroads that have experimented with it but none came up with any definite method of anchoring the cap to the concrete piling. Two precasting plants, both of whom do quite a bit of work for railroads, have experimented with a design for precasting a cap and anchoring it to concrete piling. They are thinking first of all of determining within a reasonable distance the length of the cut-off piles then fabricating either some type of large steel reinforcing that can be welded to the bottom of a steel plate or else designing some type of reinforcing cage that can be inserted in the pile and welded to the steel plate in the concrete cap. Both of these concerns are in the southeast. They had not been very successful in getting railroads interested in experimenting enough with precast-concrete cap on concrete piling.

Much work needs to be done by the railroad industry in the use of precast-concrete caps for permanent bridge work, particularly in new construction. Practically every railroad has experienced difficulty in pouring concrete at some bridge site. There is a problem, first of all, in getting ready-mix concrete available in various places and second, there is a serious problem in isolated locations of delivering concrete aggregates or ready-mix to the bridge site. This takes, in many cases, a work train hauling the materials out to the bridge site, which is terribly expensive and due to today's traffic there is a serious problem of delaying trains. The use of a precast-concrete cap avoids these problems and certainly is one of the most economical ways to convert a timber bridge to a permanent type bridge.

In summing up the use of precast-concrete caps, it is likely that railroads will get more involved in the development and use of concrete caps on both timber and permanent type bridges. On a timber bridge, for instance, the actual cost of the precast cap will vary from $70 to around $98 at the plant site per cap. Due to the spiraling increase in the cost of timber caps, this is pretty much in line with what a timber cap will cost. It is generally felt that when proper tools, and specifically some type of on track crane, are furnished to B&B gangs, that there is little difference in the labor cost between installing precast caps or timber caps on timber bridges. However, it does require a little more detailed planning to have concrete caps delivered to the bridge site compared with the use of timber caps.

Need a standard cap design

One of the things of significance in talking with some of the precasting plants was the frustrating experience that they have in working with the railroads in estimating how many caps they anticipate using for one given year, and when they expect delivery. Also, each railroad has its own particular variation in a design that is basically the same. As a result, the precasting plant has to change its forms somewhat depending

on the railroad for which it is making the precast caps. One of the biggest improvements would be for railroads to get together and come up with a standard design section. Most plants indicated that this would substantially reduce the cost of the cap and would surely have a marked effect on keeping the cap at a competitive price level. The spiraling cost of labor effects the cost of the cap when thay have to constantly change their form and pouring procedure for each individual railroad. Precast-concrete caps have a very definite place in the railroad industry on both existing timber bridges and also the few railroads that are still constructing new timber bridges. We think the use of precast caps will increase.

The use of precast-concrete caps on steel bearing piling is in its infancy. Several railroads that are not now using them have some type of precast-concrete cap for steel bearing piling on the drawing board. The railroads that are now using a precast-concrete cap on steel bearing piling seem to be very satisfied and are working on establishing this as their standard for their bridges.

As was pointed out, there is not much enthusiasm from railroads for the use of precast-concrete caps on concrete piling. There are several railroads that have experimented with this construction but they have not yet developed anything to their satisfaction. However, this kind of construction is quite common in some of the state highway departments, particularly in the southeast. The highway departments that were contacted had a basic design involving precasting a hole in the concrete piling and also a similar hole in the concrete cap. Then, after the piling are driven and cut off, the cap is matched up on top of the piling where the hole in the cap is over the hole in the piling. Rebars are dropped through the hole of the cap and the piling and high-strength grout is used to attach the concrete cap to the piling. This type design presents problems in adapting to railroad bridges as difficulty is often experienced in driving the piling as accurately as necessary to match the holes up in the precast cap to the ones in the piling. In the future, due to the spiraling cost of labor and due to the fact practically every railroad in the country is replacing timber bridges with permanent-type bridges at a pretty rapid rate, a lot of attention should be given to developing a satisfactory design of precast-concrete cap for concrete piling.

President Bryant: Thank you gentlemen, for a definitive report on a controversial subject. If there is no additional discussion, you are excused with the thanks of this Association.

We now come to our final report for this convention. This is the report of Special Committee No. 3—"Revising Work Practices to Eliminate Traffic Interference." Mr. R. C. Master, assistant engineer, Bessemer & Lake Erie, Greenville, Pa. is chairman of this Committee, and Mr. C. A. Hughes is the sponsor. Will these two gentlemen and all members of the Committee please come forward and present their report? No doubt, a subject such as this will arouse considerable pro and con thoughts and again, you are asked to give voice to any questions or discussion immediately following the report presentation.

Revising Work Practices to Minimize Traffic Interference

Report of Committee

COMMITTEE—R. C. McMaster, *Chairman*, engr.fac.& struct., B.& L.E., Greenville, Pa.; R. E. Frame, *Vice Chairman*, dist.engr., S.P., San Francisco, Calif.; C. A. Hughes, *Vice Chairman*, asst.engr.br., S.P., San Francisco, Calif.; J. C. Cook, gen.fore.b&b&ws, A.T.& S.F., Temple, Tex.; E. D. Epperson, sr.br.insp., S.L.-S.F., Springfield, Mo.; and W. H. Rankin, sr.struc.engr., S.L.-S.F., Springfield, Mo.

Today's society is rapidly changing. These changes affect the ways industries operate, and the profit they reap for their efforts. The railroads are in business to move products from one point to another, at a profit. The more expeditiously this operation can be performed, the greater the benefits. Due to new laws being passed, new wage ageements, and the demands placed on us as an industry, it is imperative that we operate with the utmost efficiency.

Pressures continue to build toward higher volumes of traffic over the railroads. These larger volumes of traffic normally must be handled with the same physical facilities that we have available. This is accomplished mainly by tighter scheduling of train movements. As a result, we in the Bridge and Buildings Department phase of the operation are restricted to shorter work periods, and more dependable scheduling of our projects that are involved with the movement of traffic.

The easiest way to do our work is in the old, proven, traditional manner, but we have witnessed in the last decade the introduction of many new materials, hardwares, tools, equipment and new construction methods. Even some of the old principles of engineering have been updated, and have given way to new thinking. Our job is to utilize our talents, experience and imagination to investigate and select the methods that will result in the greatest net benefit to the operation of our respective road.

Communication is an asset

There are many facets of progressing a given project to completion in a manner that is most advantageous to all concerned. After the need for a given item is determined, the finances arranged, and the multitude of preliminary paperwork completed, the first step is the engineering. Here, good cooperation and communication between the designer and the field supervisor can be a big asset.

R. C. McMaster

Many times the designer is unaware of field restrictions or opportunities due to the equipment that is readily available, the manpower available, and their qualifications, and what is feasible under field conditions. If the designer is made aware of these restrictions, he can usually arrange his design to circumvent them. The field construction force should work with engineering, reviewing the methods proposed, the estimated costs, and the preliminary plan. In this manner, many problems

may be eliminated in the early stages of a project

In the design stage of large projects, many considerations should be given to elimination of train delays. For example, improvement in grades and alignment, along with the value assessed to train delays, may justify relocating and constructing a complete new section of track on an offset alignment; a new structure might be erected around the existing one, so that minimum interruption to traffic is involved until the final changeout; and new structures may be detailed so that they can be built with off-track equipment. Here we are talking about relatively large undertakings. If there are competent persons doing the planning and the designing, these problems may be solved before the project gets to the construction force.

We in the Bridge & Building Department, who are charged with carrying out these projects, should first build our yearly program, and schedule the projects to dovetail into the road's total operation. Here we should consider times of the year when traffic is low. This varies with the type of tonnage that makes up the majority of the revenue freight, the section of the country the operations are in, and the type of service that the railroad provides. Secondly, climatic conditions should be considered. It is difficult to place concrete in extremely cold periods, and culvert projects should not be scheduled in periods of heavy runoff.

An area for great improvement in reducing train delays lies in the smaller projects, where the supervisor or the foreman is the sole planner, coordinator and contractor. Many of these projects have concealed problems which can delay the completion of the work. Also, due to the size of the project, the individual often does not take the time to give due consideration to all facets of it, thinking that other parts of his job require more thinking and time, and being too busy to approach the job in the manner he should. But this attitude does not reduce train delays. To accomplish this, the individual has to give each project its just consideration and thinking. These smaller projects are the ones that we will discuss in the balance of this report.

Items should be checked

The first step in improving the operation comes when the Bridge & Building Department receives the plans for a given project. Someone within the department should scan the plans, check critical details, check quantities of material, and check erection details and equipment required. True, this is an engineering function, but this is little consolidation when trains are stopped, and material is short, and there are not enough bolts to finish the project, or a member doesn't fit. It does not get trains moving to say, "Engineering made a mistake."

Next, in ordering the necessary material, a check should be run on details and quantities. The person writing the requisition has not completed his work when the purchase order is issued. He should follow up, making sure the proper material is going to be shipped by a given date to meet the project's schedule. He can help get the project off the ground by outlining a procedure, listing equipment required, and communicating the tentative dates and procedures to all departments that will be involved.

It is essential to coordinate a definite date for the project with all the departments involved in making sure that the date picked is agreeable with the Transportation Department and the Marketing Department, that the other departments assisting in the construction will have manpower available, and that this date does not conflict with their programs. Now is the time to reserve any outside equipment that has to be hired, and to double check all scheduled projects on or close to this date, to make sure that adequate manpower is available and not committed to another essential job that might be delayed and overrun its completion date.

The man in direct charge of carrying

the project to completion should outline the procedures to follow. He should list all equipment required, and make sure it is in good operating condition. It doesn't get trains moving to find out during a critical time that the crane does not have enough cable on its drums, or that the compressor will not start, or the oxygen cylinder was only half full, with no replacement available, or that someone forgot to bring an extra supply of fuel for the generators and compressor, or that there isn't an extra spark plug on the job site, or that no one thought of an extra chain for the chain saw, or, for that matter, to have an extra chain saw on hand.

Have small reserve on hand

The next point is economy. Criticism follows if a top official happens onto a job site, and each man is not gainfully employed, or if a bulldozer is hired, but not kept busy for the full day, yet is it really good sense to reduce the manpower to an absolute minimum, at the risk of prolonging the interruption to traffic? If gravel, slag or rock backfill is needed, and computations show that 500 tons should do the job, should an extra ten percent be ordered to cover Murphy's Law? If a given job requires "X" number of timbers, should only exactly "X" number of timbers be provided on the job site? The point being made here is that in situations involving train delays, it is false economy to short the job on manpower, equipment or material. It is far better to have a small reserve margin on all these items, so that the train delay time is not prolonged.

As the date for actual construction approaches, there should be: An outline of the procedure to follow, a check list of equipment and tools required, arrangements made for rental equipment, and a check made of all material. But will the material fit? Before ripping a structure assunder, to the point of an irreversible situation, is the time to check fabrication details. Just because the plan stated that a given diameter hole is to be drilled at a given location does not make it a reality. Make sure the fabricator placed the hotel where it should be, and also that it is the right-size hole. Fabricators of the materials we use are only human, and they make errors like we do.

Complete preparatory work

As much preparatory work as possible should be completed before the arrival of the actual date requiring the track out of service. If excavation is involved, proceed as far as possible in a safe manner. If rivets have to be cut out, do this and replace them with fitting-up holes. If jacking bents or shores must be built, do this. If it means getting heavy material to a given location, take care of this matter. If timber must be framed, have this completed. If lights are required for working after dark, make sure they are provided, and in working order. In other words, do everything that can physically be performed before taking the track out of service. It is better to set the predetermined date of actual construction back a day than to attempt to do the job without all the preparation work being completed.

Just before starting the main part of the project, check and make sure all involved personnel are still aware of the date, and are still in agreement with the procedure. A breakdown in communication at this point can be costly.

Now, if the supervisor has performed his work properly, the work progresses and is completed, and traffic is restored with a minimum of delay to train movements. If the job does not go in this manner, he has failed. Then is the time to review the events leading up to this day, the procedures used, and the reasons the job did not come off successfully. In this manner, we learn, and will be prepared to do a better job next time. A quotation that applies is, "He who does not learn from history, is condemned to relive it."

Ways to reduce train delays

There are many ideas that work on some roads to reduce train delay time. One road has worked out an agreement with a competitor line that parallels their track so that they trade service. One road will handle the entire train movements for both lines for a period of time while the other road accomplishes as much maintenance work as possible, with no interference from trains. Then they in turn handle all the trains while the other line completes their maintenance projects. This is cooperation at the highest level.

Another road has assigned a maintenance-of-way employee to the chief dispatcher's office. Through better communication, knowledge of the work and improved coordination, maintenance forces have been provided with more track time, at no increase to traffic delays. Still another road has found that by banding material in predetermined amounts, track time is saved in moving this material to the job site. More bridge and building personnel are turning to off-track equipment for their work, to minimize interference to traffic. The selection of the most qualified personnel to perform the work is another asset. A small item like a more standardized length of timber bolt with greater length of thread saves time .

These are a few, but there are unlimited ways and ideas to instigate improvements in bridge and building performance, and reduce the delay time to trains. Let your imagination run free, and if an idea appears to have merit, after due consideration of its effects—try it A coward never accomplished any great feats. Above all, think, plan, and don't be afraid to try new procedures and materials.

Depicts smaller projects

I would now like to show nineteen slides that pertain to these smaller projects.

(1) This first slide is an example of threading a 32-inch CMP through a 36-inch RSP. The void between the two pipes is filled by injecting grout or sand. In this manner, a culvert may be replaced without open excavation and interrupting traffic movements. Before this is considered, the size of the drainage area must be checked, and the expected run-off determined, to justify the smaller waterway opening.

(2) Here we have the installation of twin 48-inch CMP's. This shows run-of-bank gravel backfill being placed and compacted in layers. Proper backfilling of culvert installations prevents settlement and possible slow orders on traffic movement.

(3) This slide points out some of the possible hidden problems that can be incurred in culvert renewal. This small CMP was installed by the open-cut method under welded rail. Upon removing the existing RSP, it was found that the pipe had been installed inside an old stone culvert. To obtain the proper support for the new thin-shell pipe, all the old stone culvert had to be removed. This necessitated a great deal more excavation than had been contemplated, and prolonged the job to approximately twice the time that had been programmed.

(4) One method of replacing timber bridge decks is by panelizing the deck into 20-ft panels. This shows a new bridge deck, which has been panelized, and is ready for installation. You will note that the railing posts have been installed, and that the walkway planks for each section are sorted and laid in place on the panel so that they may be transported to the site along with the ties. In this manner, the handrailing and the walkway can be kept caught up. This is a big contribution toward the safety of the entire project.

(5) Here we have the renewal of a bridge deck, showing where a panel of the old deck has been removed, and the new panel is being brought in by a locomotive crane for installation.

(6) This is a view of a new timber deck which was installed under welded rail. This deck consisted of 67 ties, and the total job, including travel time to the site, installing the deck, placing the

walkway and handrailing, and travel time back to the headquarters, was accomplished in an eight-hour day. A hydraulic crane was used to remove the old ties individually, and place each new tie.

(7) The base plates on this steel bent required renewing. This is an example where preparation was very valuable. It took six weeks to prapare for this steel change, and actually four hours in between trains to install each base plate, and then approximately three weeks to clean up the site. This was accomplished by constructing two wooden jacking bents 30 ft high, and setting them on the footer on each side of the pedestal. Four 50-ton jacks were used to support the dead load of the structure, while the old base plates were removed, and the new base plates installed.

(8) This slide shows a base plate and shelf angles of a leg of a tower that has been replaced. Here with proper preparations of constructing a jacking bent, cutting the rivets out, and replacing with fitting-up bolts, this change was accomplished in three hours, between trains.

(9) This structure required raising 15 inches, due to the resurfacing of the adjacent track. It is located with a curve on each side of the bridge, and on running a top-of-rail profile, it was determined that the bridge was in a hole. This raise was accomplished by three 5-inch lifts, spaced one week apart. The structure was supported on timber blocking on the first two lifts, and at the completion of the third lift, this precast concrete bearing block was installed, with a piece of conveyor belting installed between it and the masonry plate, and also on top under the sole plate. Then the metal straps were run vertically at each corner, and welded into place to prevent movement.

(10) In placing jacks to raise a structure or renew steel, a good method is required to prevent additional delay time caused by jacks slipping or settling. This shows a jacking beam being installed between the web plates of eight-foot high girders. A beam of this type is very effective, and minimizes jacking time.

(11) Here is a jacking bracket that may be utilized at the top of legs on high towers. It can be used to replace cap plates on the legs, and also sole plates on the girders. It presents a good, solid bearing for the jacks.

(12) This is a copy of a plan showing rail supports which can be used to repair back walls, or do culvert projects, with no interruption to traffic. This shows the typical situation for use in backwalls or open trenches.

(13) Section Q-Q shows the typical cross section of the rail support. It is basically a composite beam, made up by placing two additional rails on each side of the running rail, and securing all five rails to act as a beam to carry the live load.

(14) These bridge seats on this short span were in poor condition. The masonry plates and sole plates had been completely pounded into the concrete. A temporary jacking shore was placed in front of the abutment, and, while the punky concrete was being removed, the loads were supported by placing timber blocking under the sole plates for the passage of trains. When the concrete had been cut out to an 18-inch depth, a section of "H"-piling was cut and set vertically under the sole plate. Before placing concrete, the bridge was overraised one-half inch, and supported on the jacking shore and blocking on the leading edge of the bridge seat. Then the section of "H"-piling under the sole plate was embedded in good sound concrete. This complete repair was made with no interruption to traffic.

(15) This is a close-up view of the same repair to the bridge seat. It has been completed for a two-year period, and there are no signs of additional failure.

(16) This slide shows the concrete pier under a trestle, which is simply mass concrete with no reinforcing. This pier had broken into three large sections, and was repaired by drilling and bolting the sections together, filling the

voids around the bolts with epoxy, pumping epoxy into the cracks, and then completely coating the exterior of the pier with epoxy to prevent any moisture entering the concrete.

(17) Here is a finished view of the repaired pier It does not present a pleasing appearance, but this repair has been completed for a period of six years with no additional signs of failure.

(18)This is a view of a small 30-ft span bridge, which was showing great signs of distress, caused by the abutments moving in. The backwalls had also broken off, due, to the pressures exerted on them. This small structure was salvaged by placing pipe struts between the abutments, to prevent further movement. The old backwalls were removed, and new backwalls constructed, with the addition of buttresses to help support them. These repairs have been completed approximately 14 years, with no additional signs of movement occurring, or distress within the structure.

(19) This is a close-up view of the same structure, showing the new backwalls and buttresses used for additional support. This also shows a jacking pocket cut into the leading edge of the bridge seat, which is a very convenient method for placing jacks to raise a structure.

If railroads are to remain competitive with other modes of transportation, all train delays must be kept to a minimum. In bridge and building work, a large area for improvement is in the small jobs. Reducing construction time is accomplished by more complete planning, better programming, and explicit checking of details. Never assume anything is correct, or is being taken care of. In bridge and building work, it pays to be a pessimist, and a believer in Murphy's Law.

President Bryant: Gentlemen, the Association thanks you for this fine report, which contained much valuable information. You are now excused.

The Nominating Committee, which is composed of the five most recent Past Presidents, has been busy attempting to pick a slate of candidates to serve our Association in the coming year, as Officers and Directors.

As you are aware, the names to be presented are recommendations only, and other names may be nominated from the floor.

Mr. T. L. Fuller, is Vice-Chairman of the Nominating Committee. Mr. Fuller will you please come to the speaker's table and conduct the election and installation of those selected.

I should like to once again, thank each member, Director and Officer for the wholehearted help and support they have given me during the past year while I have served as your President. Without this support, it would have been impossible for me to have functioned in this capacity and I truly appreciated this help. As I change "Hats" and become the immediate Past President, I ask your continued support for my successor. I know he will appreciate it as I have.

Mr. Fuller, will you please begin the election.

Fuller conducted election and installation of Officers and Directors.

HISTORICAL INFORMATION

List of Annual Conventions

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Sept. 25, 1891	60
2	Cincinnati, Ohio	Oct. 18-19, 1892	112
3	Philadelphia, Pa.	Oct. 17-19, 1893	128
4	Kansas City, Mo.	Oct. 16-18, 1894	115
5	New Orleans, La.	Oct. 15-16, 1895	122
6	Chicago, Ill.	Oct. 20-22, 1896	140
7	Denver, Colo.	Oct. 19-21, 1897	127
8	Richmond, Va.	Oct. 18-19, 1898	148
9	Detroit, Mich.	Oct. 17-19, 1899	148
10	St. Louis, Mo.	Oct. 16-18, 1900	143
11	Atlanta, Ga.	Oct. 15-17, 1901	171
12	Minneapolis, Minn.	Oct. 21-23, 1902	195
13	Quebec, Canada	Oct. 20-22, 1903	223
14	Chicago, Ill.	Oct. 18-20, 1904	293
15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jacksonville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans. La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840
31	New York, N. Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N. Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597

No.	Place of Meeting	Date	Membership
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
56	Chicago, Ill.	Sept. 17-19, 1951	676
57	Chicago, Ill.	Sept. 15-17, 1952	667
58	Chicago, Ill.	Sept. 15-17, 1953	666
59	Chicago, Ill.	Sept. 13-15, 1954	682
60	Chicago, Ill.	Sept. 19-21, 1951	625
61	Chicago, Ill.	Sept. 18-20, 1956	657
62	Chicago, Ill.	Sept. 23-25, 1957	769
63	Chicago, Ill.	Sept. 15-17, 1958	828
64	Chicago, Ill.	Sept. 15-17, 1959	863
65	Chicago, Ill.	Sept. 19-21, 1960	932
66	Chicago, Ill.	Sept. 18-20, 1961	968
67	Chicago, Ill.	Sept. 10-12, 1962	942
68	Chicago, Ill.	Oct. 14-16, 1963	887
69	Chicago, Ill.	Sept. 14-16, 1964	860
70	Chicago, Ill.	Sept. 13-15, 1965	829
71	Chicago, Ill.	Sept. 26-28, 1966	800
72	Chicago, Ill.	Oct. 11-13, 1967	799
73	Chicago, Ill.	Sept. 9-11, 1968	825
74	Chicago, Ill.	Sept. 9-11, 1969	746
75	Chicago, Ill.	Sept. 28-30, 1970	709
76	Chicago, Ill.	Sept. 13-15, 1971	719
77	Chicago, Ill.	Sept. 18-20, 1972	706
78	Chicago, Ill.	Sept. 17-19, 1973	750

Past Officers

	1891-1892	1892-1893	1893-1894	1894-1895
President	O. J. Travis	H. M. Hall	J. E. Wallace	Geo. W. Andrews
1st V.-Pres.	H. M. Hall	J. E. Wallace	Geo. W. Andrews	W. A. McGonagle
2nd V.-Pres.	J. B. Mitchell	G. W. Hinman	W. A. McGonagle	L. K. Spafford
3rd V.-Pres.	James Stannard	N. W. Thompson	L. K. Spafford	James Stannard
4th V.-Pres.	G. W. Hinman	C. T. Fuller	E. D. Hines	Walter G. Berg
Secretary	C. W. Gooch	S. F. Patterson	S. F Patterson	S. F. Patterson
Treasurer	George M. Reid	George M. Reid	George M. Reid	George M. Reid
Executive Members	W. R. Damon	G. W. Andrews	Q. McNab	James Stannard
	G. W. Markley	J. M. Staten	A. S. Markley	James H. Travis
	W. A. McGonagle	J. M. Caldwell	Floyd Ingram	J. H. Cummin
	C. W. McGehee	Q. McNab	James Stannard	R. M. Peck
	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

	1895-1896	1896-1897	1897-1898	1898-1899
President	W. A. McGonagle	James Stannard	Walter G. Berg	J. M. Cummin
1st V.-Pres.	L. K. Spafford	Walter G. Berg	J. H. Cummin	A. S. Markley
2nd V.-Pres.	James Stannard	J. H. Cummin	A. S. Markley	C. C. Mallard
3rd V.-Pres.	Walter G. Berg	A. S. Markley	G. W. Hinman	W. A. Rogers
4th V.-Pres.	J. H. Cummin	R. M. Peck	C. C. Mallard	J. M. Staten
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	R. M. Peck	W. O. Eggleston	G. J. Bishop	Wm. S. Danes
	L. J. White	W. M. Noon	C. P. Austin	J. H. Markley
	A. Shane	J. M. Staten	M. Riney	W. O. Eggleston
	A. S. Markley	G. J. Bishop	Wm. S. Danes	R. L. Heflin
	W. M. Noon	C. P. Austin	J. H. Markley	F. W. Tanner
	J. M. Staten	M. Riney	W. O. Eggleston	A. Zimmerman

	1899-1900	1900-1901	1901-1902	1902-1903
President	Aaron S. Markley	W. A. Rogers	W. S. Danes	B. F. Pickering
1st V.-Pres.	W. A. Rogers	W. S. Danes	B. F. Pickering	C. C. Mallard
2nd V.-Pres.	J. M. Staten	B. G. Pickering	A. Shane	A. Shane
3rd V.-Pres.	Wm. S. Danes	A. Shane	A. Zimmerman	A. Zimmerman
4th V.-Pres.	B. F. Pickering	A. Zimmerman	C. C. Mallard	A. Montzheimer
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	N. W. Thompson	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	T. M. Strain	T. M. Strain	A. Montzheimer	W. E. Smith
	R. L. Heflin	H. D. Cleaveland	W. E. Smith	A. W. Merrick
	F. W. Tanner	F. W. Turner	A. W. Merrick	C. P. Austin
	A. Zimmerman	A. Montzheimer	C. P. Austin	C. A. Lichty
	H. D. Cleaveland	W. E. Smith	C. A. Lichty	W. O. Eggleston
	A. Montzheimer	A. W. Merrick	W O. Eggleston	J. H. Markley

	1903-1904	1904-1905	1905-1906	1906-1907
President	A. Montzheimer	C. A. Lichty	J. B. Sheldon	J. H. Markley
1st V.-Pres.	A. Shane	J. B. Sheldon	J. H. Markley	R. H. Reid
2nd V.-Pres.	C. A. Lichty	J. H. Markley	R. H. Reid	J. P. Canty
3rd V.-Pres.	J. B. Sheldon	R. H. Reid	R. C. Sattley	H. Rettinghouse
4th V.-Pres.	J. H. Markley	R. C. Sattley	J. P. Canty	F. E. Schall
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	W. O. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907-1908	1908-1909	1909-1910	1910-1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres.	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres.	J. N. Penwell	L. D. Hadwen	G. Aldrich	G. W. Rear
3rd V.-Pres.	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres.	T. J. Fullen	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres.	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres.	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Stronse
3rd V.-Pres.	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres.	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Stronse	A. Ridgway	J. S. Robinson
	W. F. Stronse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Stronse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
See.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres.	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres.	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
See.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	P. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Kransch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCoy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary	.....	.....	F. O. Whiteman	A. G. Shaver
Treasurer	.....	.....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

† To November 1, 1962 ‡ To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Treasurer	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. H. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959	1959-1960	1960-1961	1961-1962
President	M. H. Dick	B. M. Stephens	H. D. Curie	G. W. Benson
1st V.-Pres.	B. M. Stephens	H. D. Curie	G. W. Benson	J. M. Lowry
2nd V.-Pres.	H. D. Curie	G. W. Benson	J. M. Lowry	E. R. Schlaf
3rd V.-Pres.	G. W. Benson	J. M. Lowry	E. R. Schlaf	H. A. Matthews
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhause
Directors	J. M. Lowry	W. H. Bunge	H. A. Matthews	R. C. Baker
	R. C. Baker	E. R. Schlaf	M. J. Hubbard	R. H. Miller
	W. H. Bunge	H. A. Matthews	R. C. Baker	Shirley White
	E. R. Schlaf	M. J. Hubbard	R. H. Miller	H. M. Wilson
	H. A. Matthews	R. C. Baker	Shirley White	R. D. Hellweg
	M. J. Hubbard	R. H. Miller	H. M. Wilson	F. W. Hutcheson

	1962-1963	1963-1964	1964-1965	1965-1966
President	J. M. Lowry	E. R. Schlaf	R. C. Baker	H. M. Wilson
1st V.-Pres.	E. R. Schlaf	R. C. Baker	H. M. Wilson	R. D. Hellweg
2nd V.-Pres.	H. A. Matthews	Shirley White	R. D. Hellweg	J. W. DeValle
3rd V.-Pres.	R. C. Baker	H. M. Wilson	J. W. DeValle	W. F. Armstrong
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	E. F. Snyder	E. F. Snyder	E. F. Snyder
Directors	Shirley White	R. D. Hellweg	W. F. Armstrong	J. A. Goforth
	H. M. Wilson	F. W. Hutcheson	J. S. Ellis	E. R. Simmons
	R. D. Hellweg	W. F. Armstrong	J. A. Goforth	N. D. Bryant
	F. W. Hutcheson	J. W. DeValle	E. R. Simmons	A. R. Dahlberg
	W. F. Armstrong	J. A. Goforth	N. D. Bryant	J. S. Ellis
	J. W. DeValle	E. R. Simmons	A. R. Dahlberg	T. L. Fuller

	1966-1967	1967-1968	1968-1969	1969-1970
President	R. D. Hellweg	J. W. DeValle	W. F. Armstrong	J. A. Goforth
1st V.-Pres.	J. W. DeValle	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg
2nd V.-Pres.	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg	T. L. Fuller
3rd V.-Pres.	J. A. Goforth	A. R. Dahlberg	T. L. Fulle	N. D. Bryant
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	N. D. Bryant	J. S. Ellis	N. F. Lucas	W. H. Rankin
	A. R. Dahlberg	T. L. Fuller	W. L. Short	E. E. Runde
	H. F. Lucas	R. A. Youngblood	C. E. Wachter	T. A. Reynolds
	J. S. Ellis	H. F. Lucas	A. C. Jones	J. J. Ridgeway
	T. L. Fuller	W. L. Short	W. H. Rankin	J. R. Williams
	R. A. Youngblood	C. E. Wachter	E. E. Runde	J. W. Chambers
	V. D. Raessler	A. C. Jones	T. A. Reynolds	R. E. Frame
	W. L. Short	W. H. Rankin	J. J. Ridgeway	J. C. Hobbs
	C. E. Wachter	E. E. Runde	J. R. Williams	

	1970-1971	1971-1972	1972-1973	1973-1974
President	A. R. Dahlberg	T. L. Fuller	N. D. Bryant	
1st V.-Pres.	T. L. Fuller	N. D. Bryant	E. E. Runde	
2nd V.-Pres.	N. D. Bryant	E. E. Runde	J. J. Ridgeway	
3rd V.-Pres.	E. E. Runde	J. J. Ridgeway	J. R. Williams	
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	
Directors	T. A. Reynolds	J. W. Chambers	R. K. Corbett	
	J. J. Ridgeway	R. E. Frame	J. R. Iwinski	
	J. R. Williams	J. C. Hobbs	J. S. Pritchett	
	J. W. Chambers	R. K. Corbett	D. C. Gould	
	R. E. Frame	J. R. Iwinsky	W. S. Stokeley	
	J. C. Hobbs	J. S. Pritchett	W. C. Sturm	
	R. K. Corbett	D. C. Gould	J. W. Davidson	
	J. R. Iwinsky	W. S. Stokeley	C. A. Hughes	
	J. S. Pritchett	W. C. Sturm	W. R. Hyma	

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ALEXANDRIA, VA. 22313

Memphis, Tenn. Alva, Okla.

Jacksonville, Fla.

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussion unless the same have received the endorement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with roadway bridge, building and water service work, or in the employ of a public regulatory body, a professor of engineering in a college, an engineering editor, or a government or private timber expert. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

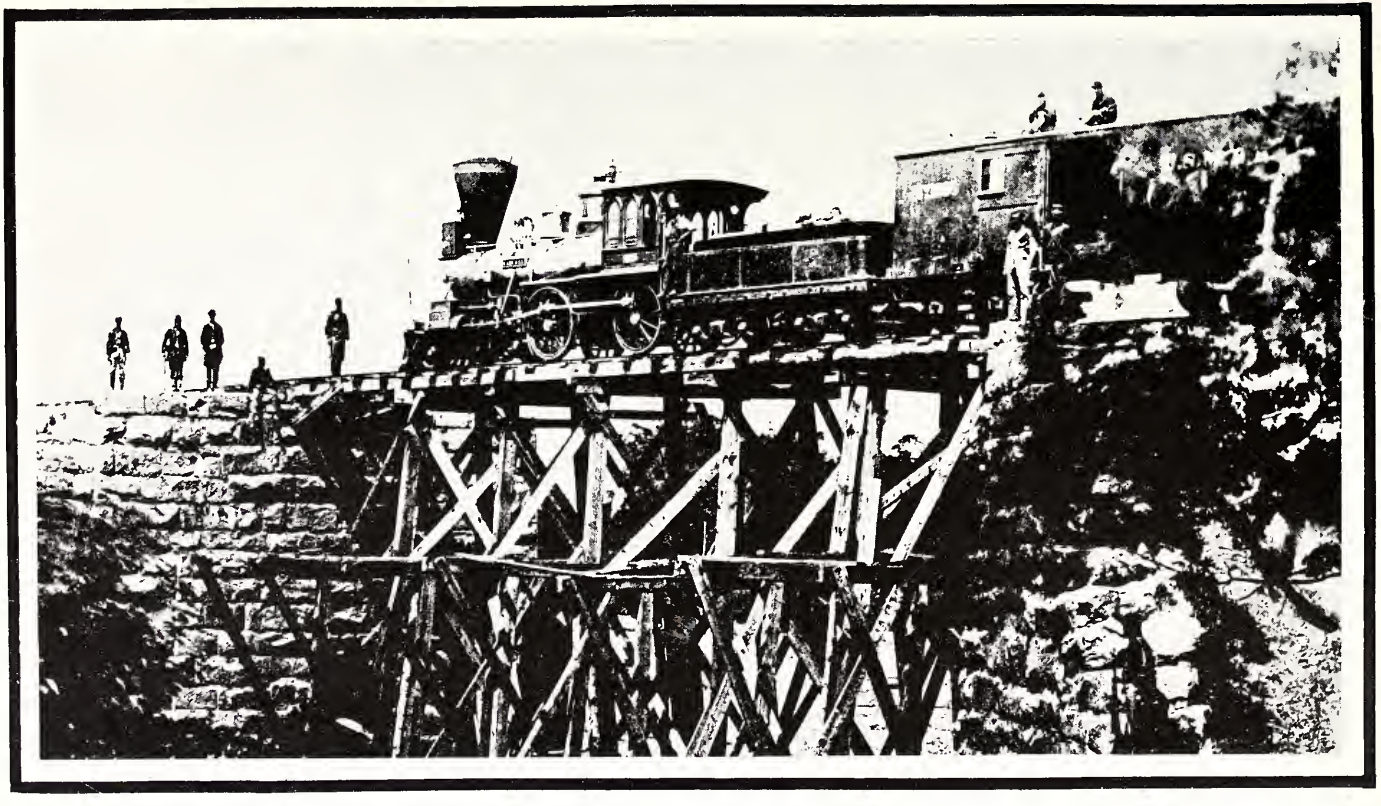
Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2 of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the executive committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

* Amended October 16, 1941.
** Amended September 20, 1948
†† Amended March 10, 1958.

BUILDING INSURANCE BRIDGES



FOR THE RAILROAD INDUSTRY SINCE 1913.

BENEFIT TRUST LIFE INSURANCE COMPANY 1771 HOWARD STREET CHICAGO, ILLINOIS 60626 (312) 274-8100

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Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1§. The officers of the Association shall be a president, three vice-presidents, a secretary, a treasurer and nine directors, who, with the most recent past president, shall constitute the Executive Committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members shall be privileged to attend all meetings of the executive committee, at which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for re-election.

Section 2.§ The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, three directors being elected each year. All officers shall retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section. 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

** Amended October 16, 1941.
† Amended September 21, 1957.
§ Amended September 28, 1966.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears, may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany applicants) or at the discretion of the executive committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

By-Laws

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the executive committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall be within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

***DUES

5. The annual dues for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $7.00; Associate Members, $7.00; Junior Members, $5.00.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio mem-

† Amended October 17, 1940.
* Article adopted 1922.
** Amended September 20, 1948
‡ Amended September 21, 1957.
*** Amended September 15, 1965.

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ber of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

‡ Adopted October 17, 1940.
# Amended December 4, 1950.
† Amended September 20, 1948.
‡ Amended September 21, 1957.

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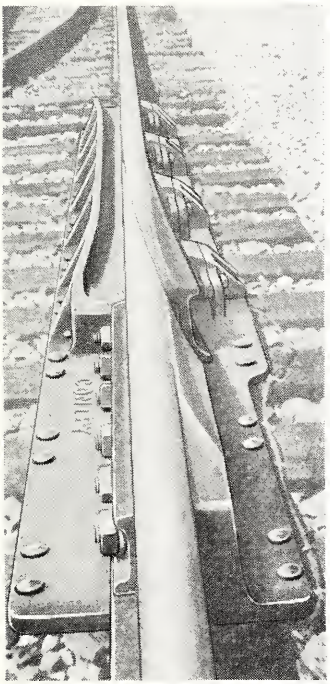

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ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions. motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called executive committee meeting.

† Amended September 20, 1948.

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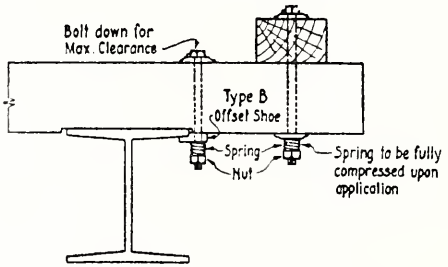

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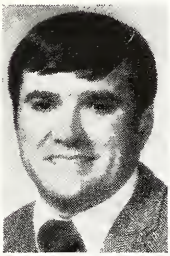

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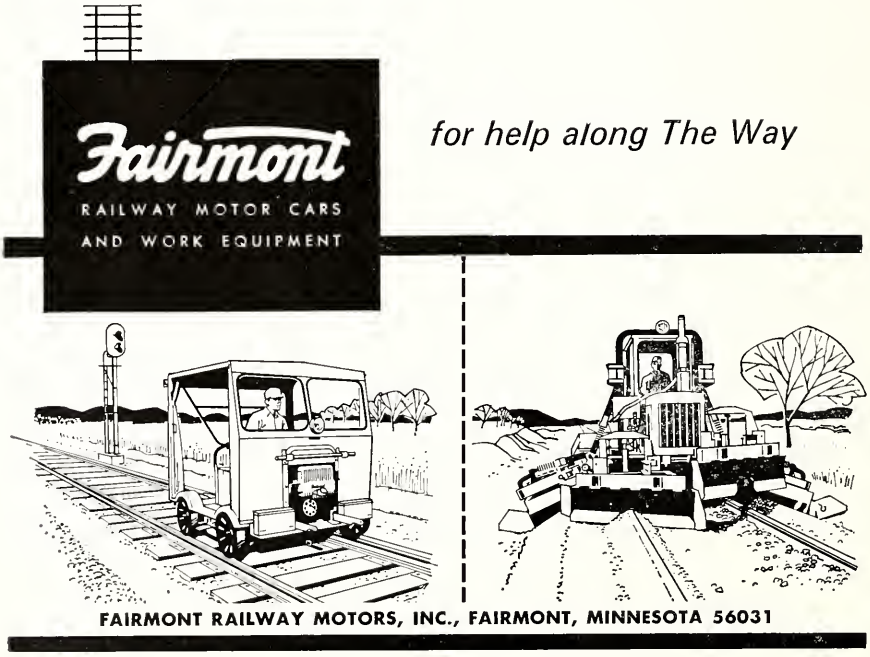

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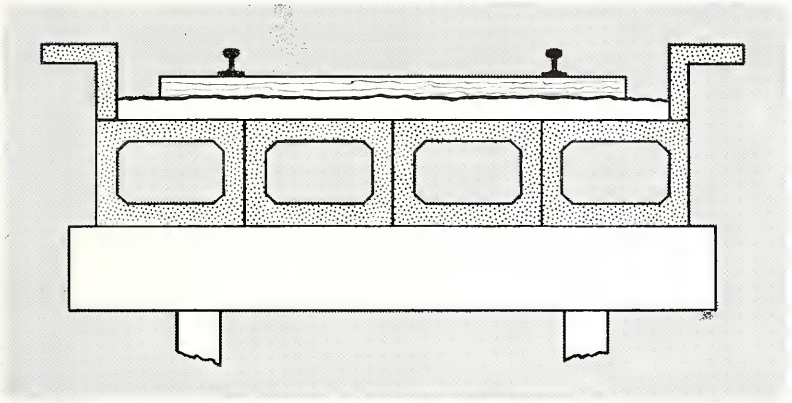

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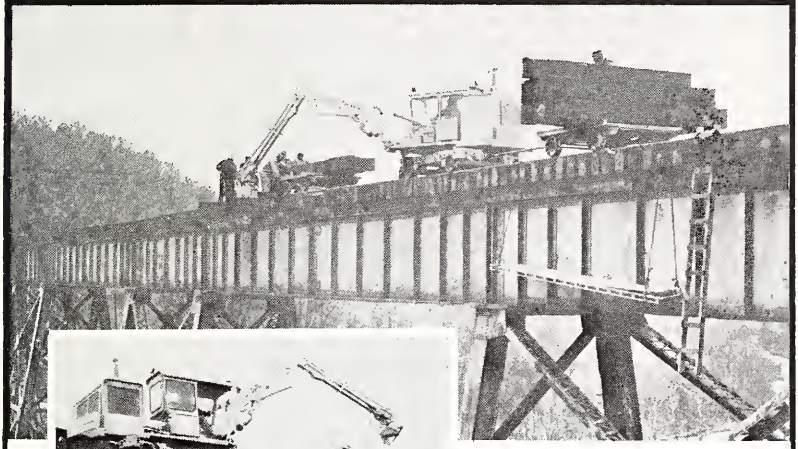

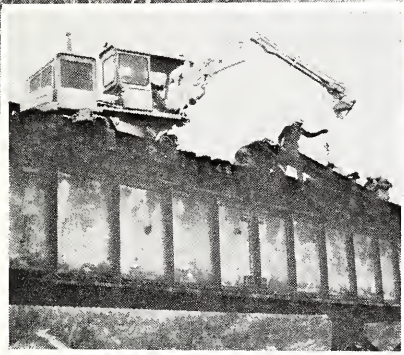

Pictured above — New ties are on the push car behind the crane. Old ties are placed on the push car in front. The Bridge Crane removes old ties and installs new ones by clamping the ends of the ties.

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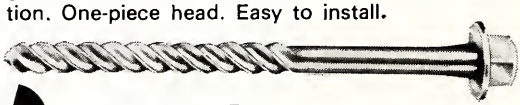

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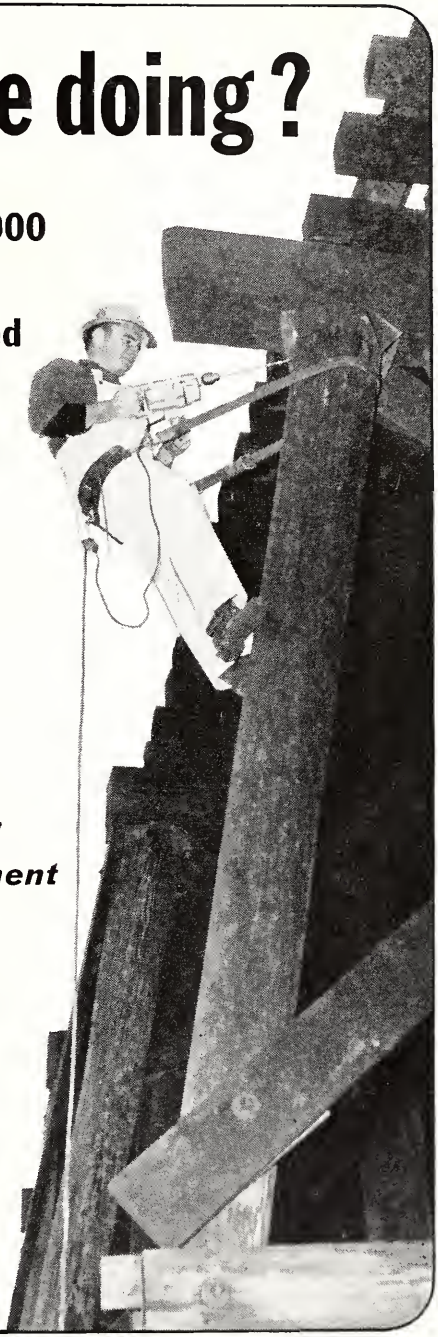

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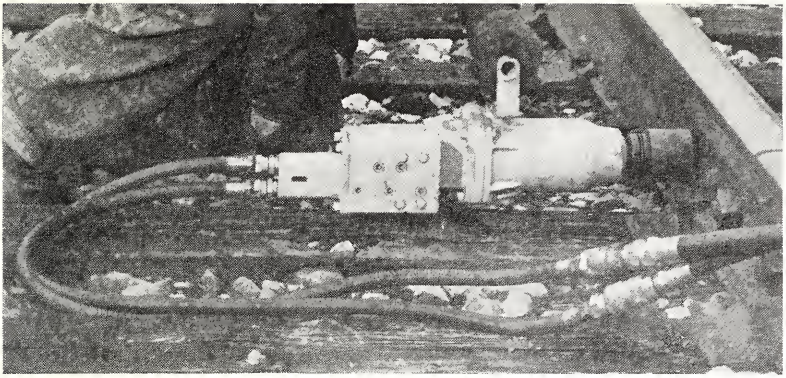

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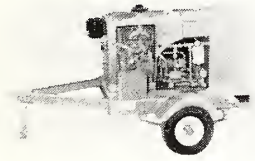

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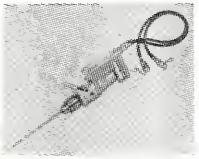

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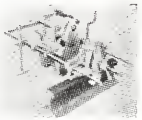

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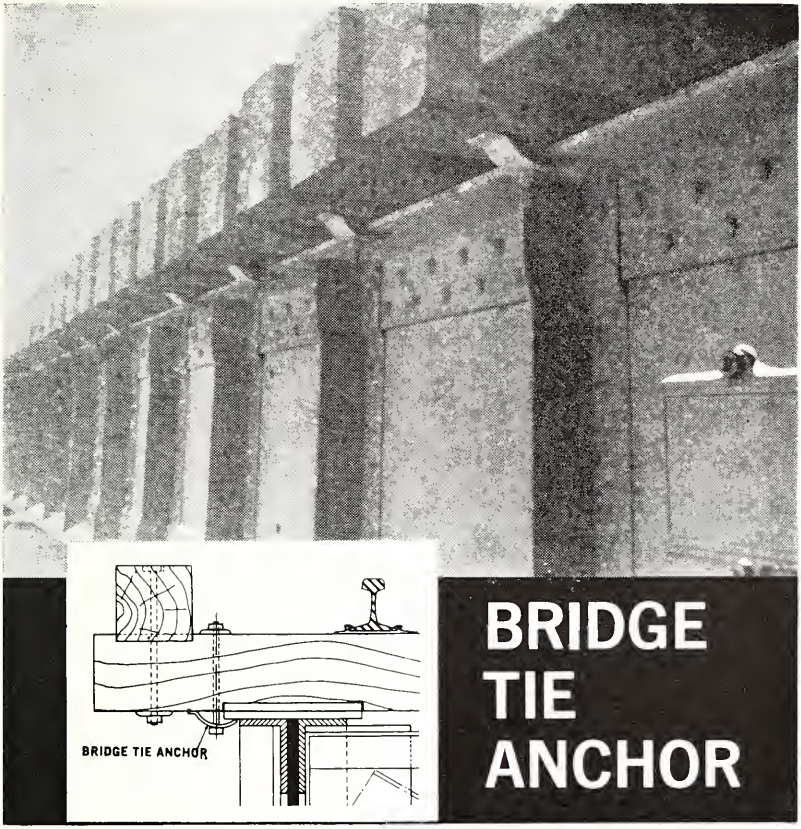

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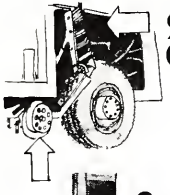

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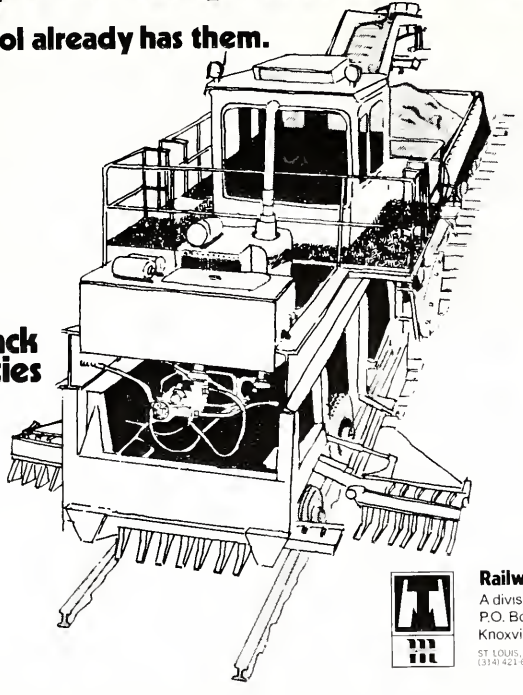

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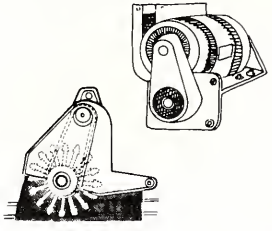

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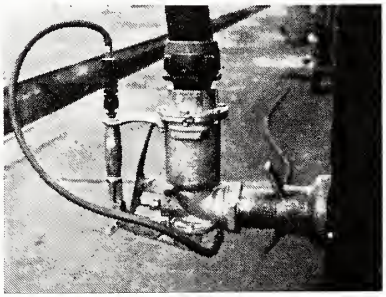

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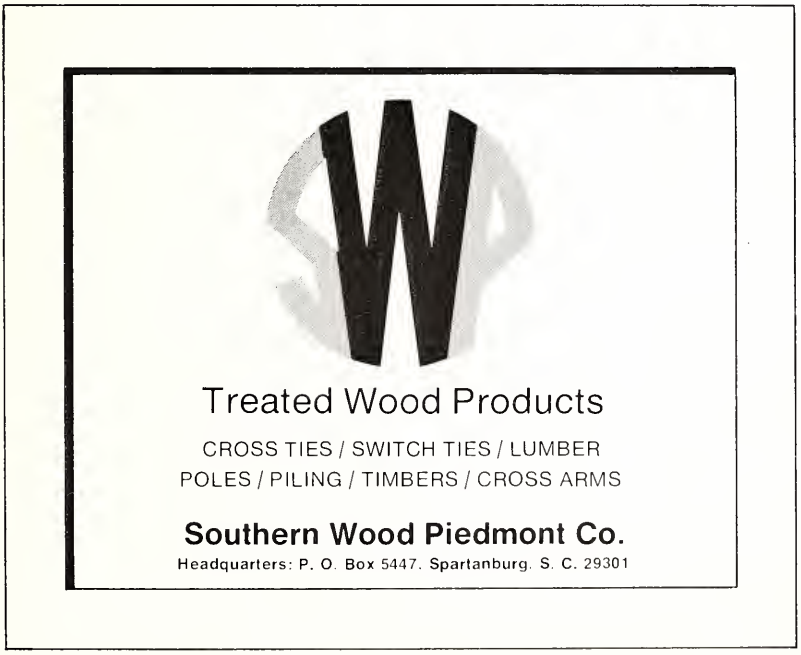
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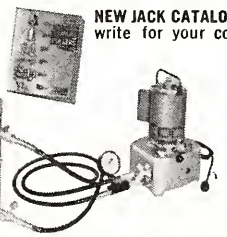

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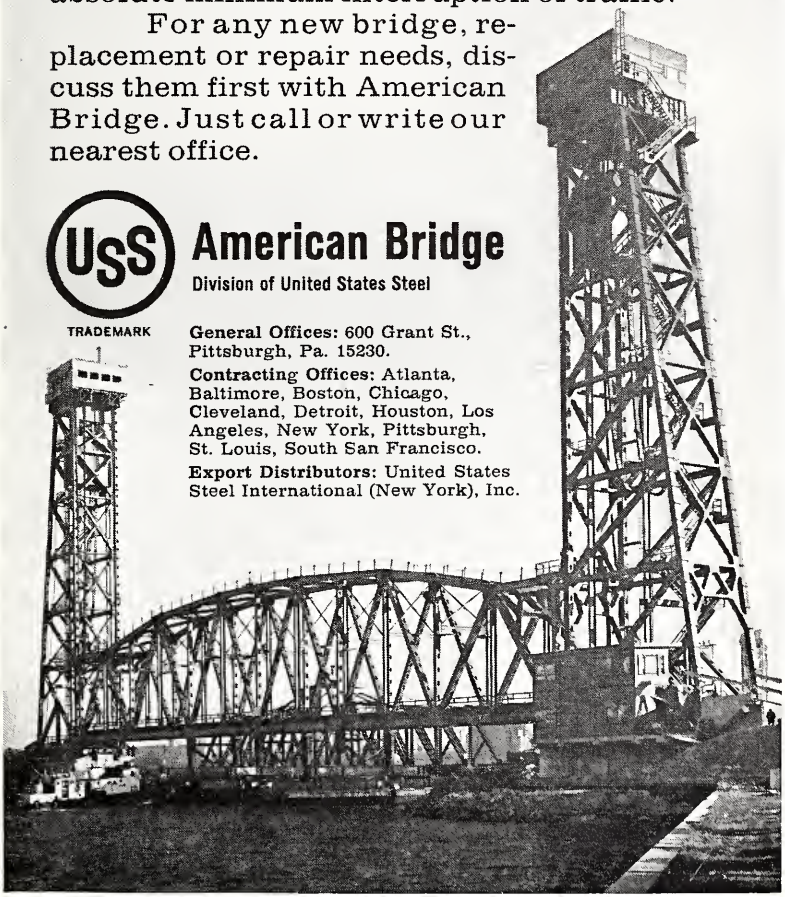

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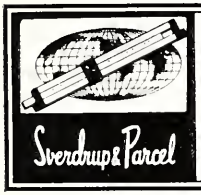

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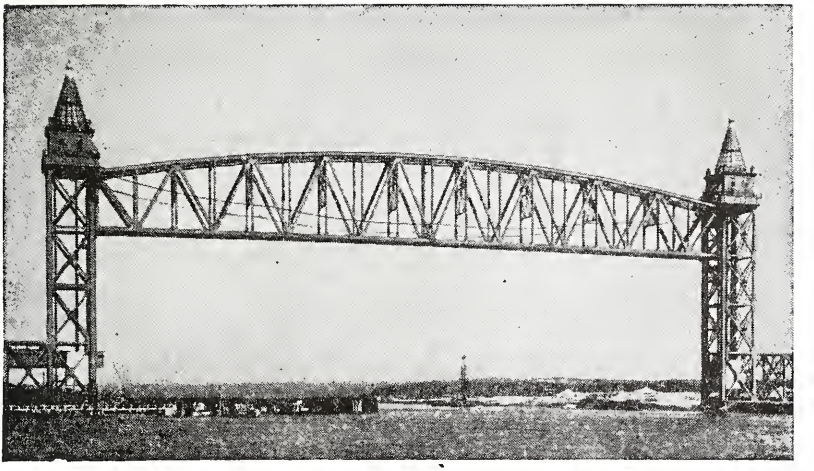

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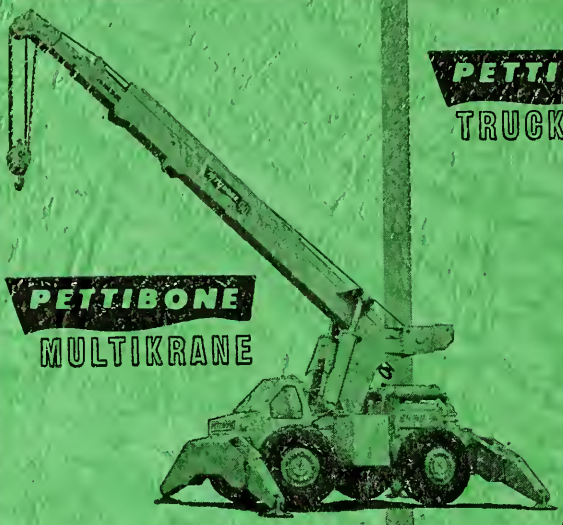
Torrence Avenue Bridge Chicago, Ill.	1936
Cape Cod Canal Bridge Buzzards Bay, Mass.	1935



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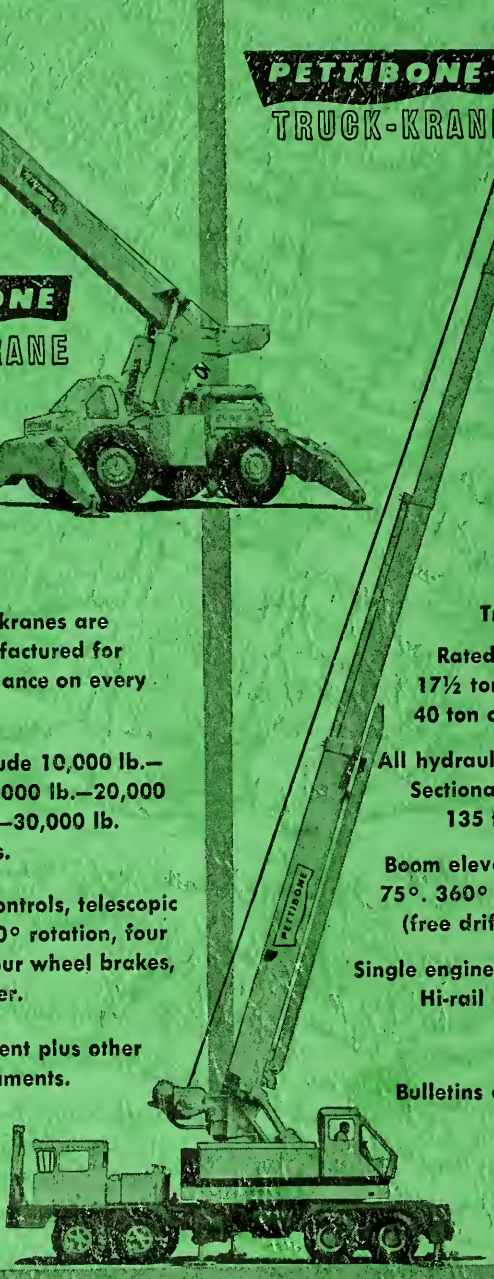

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